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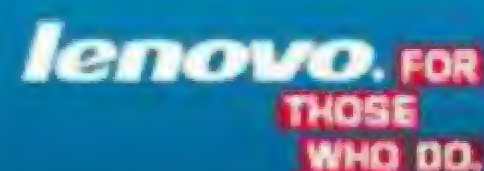


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## BARRY COLLINS gets a nasty shock when he discovers that the Sky router's the limit

**I**t took them two years to wear me down, but finally I succumbed to the relentless letter-bombing. Three months' free broadband? No, thanks. Six months? Tempted, but no dice. A year? Where do I sign?

It was with a genuinely heavy heart that I made that call to Zen Internet and said I was leaving. My old ISP hadn't done anything wrong – it wasn't them, it was me. The support assistant was as prompt and courteous as ever, but I could detect the disappointment in his voice. "Where you off to, mate?" he asked, dispensing with the formalities in typical Rochdale fashion. "Erm, Sky," I muttered. "Oh," came the reply.

Oh, indeed. The support assistant was too well mannered to spell it out, but we both knew the subtext. "You're leaving a small, multiple-award-winning British ISP, whose support staff have been nothing but knowledgeable and brutally efficient on the few occasions you've needed to call them over the past seven years, to become another customer service ticket in the Sky call centre," is what he was too polite to say. "Are you really that cheap?"

Yes, I am – we're in the middle of a financial meltdown, and £400 saved ISP fees over the next year would come in handy. The kids have stubbornly resisted the idea of spending their birthday money on their school uniforms, and British Gas is refusing to accept that its computer system is sending me Buckingham Palace's heating bill, so something has to give. Besides, I'm the editor of a PC magazine – if there were any technical issues with Sky, I was sure I'd be able to sort them out myself.

Fate tempted, I hit problems almost from day one. After I'd fished my new Sky router out of the bin (see more courier nightmares on p40) and plugged it in, my connection speed swiftly dipped to half what I was achieving with Zen. ADSL connections go through a ten-day training period, during which, allegedly, the ISP keeps edging up the speed to see how much it can cope with – but, if anything, my connection speeds were getting worse. What's more, the range of the Sky-supplied router wasn't a patch on my previous Fritz!Box model. I live in one of those modern houses where the walls are so thin you can hear next door's budgie breaking wind, yet the Sky router was struggling to send a reliable signal through a couple of walls.

So, I decided to see if using my old Fritz!Box instead of the bundled Sky router would improve matters. Different ADSL chipsets

can have a huge impact on connection speeds, and I knew the Wi-Fi range of the Fritz!Box was much greater than that of Sky's router.

There was only one problem: in none of the 67 emails Sky had sent me since registering were there any network login details. Sky's router comes preconfigured with network logins, and the router firmware wouldn't cough up the login or password, either.

At this point, I started Googling to find out how to connect a third-party router to Sky's network and soon received my answer: you can't. Sky doesn't allow it. Even if you ring Sky support and ask for your network login, they won't hand it over. I know, because I've tried. All I got was the runaround from the world's most genial Irishman, and the default router admin password, which the happy-go-lucky Dubliner confused for the network login.

The only way to connect a third-party router to Sky's network involves some Gary McKinnon-style hackery, using a piece of Windows software to drag the necessary login details out of the Sky router (*see p150*). Even then, there's no guarantee it will work.

**It had simply never occurred to me that an ISP would effectively ban customers from using their own router equipment**

Sky's attitude to third-party routers has left me flabbergasted. It had never occurred to me that an ISP would effectively ban customers from using their own router equipment. I can understand why a network with millions of customers wants to standardise support, but at least let those of us with enough technical nous to enter a few login details in router firmware wizards proceed at our own risk. To refuse to hand over logins and passwords is churlish, especially when the supplied Sky router is so poor (*see p151*).

There's a happy ending to my story. Sky agreed to turn up the gain on my line, and my ADSL sync speed is now almost twice as fast as it was under Zen. And, given that the only room in my house where I can't get a reliable Wi-Fi signal is the upstairs bathroom, I've even decided to leave the ropey Sky router in place, lest a switch to the Fritz!Box kick-starts a new round of line training and causes speeds to drop again. You pay no money, you get no choice.



“

”

**BARRY COLLINS** is the editor of *PC Pro* – a fact he was sorely tempted to point out to Sky's support team (but didn't) when they refused to give him his login.

**Blog:** [www.pcpro.co.uk/links/barryc](http://www.pcpro.co.uk/links/barryc)

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## As smartphones get bigger, **DARIEN GRAHAM-SMITH** says it's good not to talk

**M**y mobile phone contract is up for renewal soon, so I've been sniffing around the current batch of Android handsets. They're getting quite large, aren't they? The latest flagships from HTC and Samsung – the One and the Galaxy S4 (*see p104*) – come with 4.7in and 5in screens respectively, and Samsung's Galaxy Mega models promise displays of up to 6.3in. The Asus Fonepad (*see p102*) stretches to an ambitious 7in tablet-style form factor.

I must say, I'd thought oversized phones were something we'd left in the 1990s, along with acid-wash jeans and ambient dub. It isn't that I object to largeish devices per se – I happily carry my Nexus 7 around in my jacket pocket, since it gives my games and apps more space to breathe than my phone does. You might, therefore, expect me to jump at one of these new tablet-sized phones – or “phablets”, as some deplorable marketing wonk seems to have named them.

What's held me back, however, is the indisputable, cast-iron fact that it's impossible to have a phone conversation with one of these unwieldy rectangles clamped to your ear without looking utterly ridiculous.

That may sound like a petty concern, but think of the early iPhones. I'm not suggesting people bought them purely as fashion accessories, but there's no denying they had a glamorous image, which isn't something that can be said for jumbo-sized Android devices. The first time I saw a city gent in the street muttering into a comically outsized Galaxy Note, my instinct was to point and laugh. So you'll understand why I've been reluctant to invest in a similar device myself.

Yet this issue is starting to seem less important than it once did. It isn't that manufacturers have found a more elegant way to handle voice calls – the latest crop of devices are just as uncomfortably slab-like as the older models. Rather, I've realised I don't actually make voice calls any more.

There was a time when I used to make and receive calls every day, but that was back when mobile email was a geeky proof of concept and Facebook was a trendy Harvard start-up. Today, mainstream phones have morphed into general-purpose internet devices, and we've developed a dozen more flexible ways of keeping in touch. Without noticing it, I've wholly dropped out of the habit of actually ringing people up.

It isn't only me, either. A decade ago, when I used to commute to work on the number 21 bus, the upper deck regularly buzzed with the chit-chat of my fellow passengers, yakking away on their primitive clamshells. Today, my travelling companions are more likely to use their phones for texting, tweeting, playing social games and listening to music. Peace doesn't reign exactly, but it's mercifully rare to find yourself party to one half of someone else's conversation.

Even in domestic settings, voice calling isn't as ubiquitous as it once was. Of course, friends and families are still talking to one another, but they're starting to do it over IP-based video systems, rather than making old-fashioned phone calls. The numbers may be small right now, but they're growing, and not just among techies: actual members of my family are already using Skype and FaceTime. Welcome to the future.

I realise the traditional phone call is a long way from extinction. I have many friends and colleagues who still prefer viva voce conversation as their primary means of

**Voice calling is a legacy application, and 'mobile phone' is no longer an accurate term for the device I want in my pocket**

communication. Many of them always will, probably. The shift has started, but it's far from complete.

For me, though, voice calling is already a legacy application – and it's fair to say “mobile phone” is no longer an accurate term for the sort of device I want in my pocket. What I'm really looking for is an app platform with a decent-sized screen and an always-on data connection. I suppose I still want the capability to make voice calls, but only for emergencies.

Conveniently enough, this happens to be more or less the dictionary definition of a “phablet” – or at least it would be, were any dictionary publisher lax enough to admit such an odious neologism.

In short, I've decided to stop worrying about how my next handset will look against the side of my head. These days, the real question is how such a device can help me keep in touch via the methods I actually use – namely email, Twitter and Facebook.



“

”

**DARIEN GRAHAM-SMITH** is PC Pro's technical editor. You can email him at the address below, or talk to him on Twitter at @DarienGS – just don't phone him.

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# FEEDBACK



THE PICK OF YOUR COMMENTS FROM EMAILS, BLOGS OR PCPRO.CO.UK



## Should parents take responsibility for apps downloaded by their children?

with a remote control's numeric keypad are so painful that they're not worth doing, let alone typing anything longer or using more complex apps.

I know there are third-party options available, but none of them are particularly good solutions, and they're not viable for those who aren't savvy enough in the right areas. Take my 84-year-old mother: she's fine when it comes to using the keyboard and mouse with her PC, but the onscreen keyboard and remote control combination she has to use with her Sony TV is beyond her; my telephone support is becoming more frequent.

I'm sure 4K TVs will take us to the next level, but can someone please tell the TV manufacturers that they need to work on their remote controls! **MARK ROBSON**

## Windows Home Server replacements

I've always taken backup seriously, and I've belatedly read Darien Graham-Smith's article on the subject (*see issue 217, p58*). It piqued my interest for one major reason – he confirmed that Microsoft is no longer working on Windows Home Server.

Back in 2007, I took your advice and invested in a Windows Home Server 2008 machine. For the past five years I've left the system in the loft, and it's done great work: for daily, secure full-system backup and hourly critical-file backup it's superb. It also stores all of my CDs and DVDs for distribution around my home network. It even rescued my PC when the hard disk failed; I downloaded the necessary boot CD, replaced the two failed RAID5 hard disks, and the system was recovered to its position from the previous evening.

I've recently upgraded my three PCs to Windows 8 and installed the connector software on each PC. Windows Home Server immediately recognised them, added them to its recovery pool and backed them up.

With Windows Home Server dying, I'd appreciate some advice on a NAS or Windows 8-based server, or any other backup options you can recommend. I'm looking for full-system backup, automated and without



## Child's play

The Office of Fair Trading is investigating apps and sites that encourage children to spend money on in-game purchases, and I agree that these apps are disgraceful in their attitude and approach. Parents need to take some responsibility and not just assume that the store owner or app developer will look after their children.

I check what I'm downloading for my son to use. It takes time, it's a pain, and I wish I didn't have to, but that's life. The more open a system, the more care parents need to take. We're the adults here – we can't have all of the benefits without any of the costs. **MATBAILIE**

**Editor Barry Collins replies:** I'm torn on this issue. On the one hand, I agree that parents need to take more responsibility when handing phones to their children; on the other, both handset manufacturers and games publishers should be more responsible. It simply shouldn't be possible, for example, to buy £70 worth of in-game credits in one hit, as it is with some smartphone titles. Clearer explanations of child-safety features would also help.



## Control freaks

Jon Honeyball's recent column about 4K TVs (*see issue 224, p162*) was spot on – manufacturers surely won't deliver these products without doing research to discover how they'll be used.

However, I'm surprised that manufacturers haven't spotted a major usage problem.

Smart TVs replace or complement a lot of casual PC or mobile apps, but manufacturers continue to deliver a traditional remote control – a great hunk of outdated technology – with their smartest TVs. Even basic tasks such as logging in to Twitter or Facebook







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## STAR LETTER

**I**'ve read Darien Graham-Smith's Technolog (*see issue 223, p9*) where he argues it's time to ditch CDs and DVDs. You can't deny the trend, but I don't think the time is right to completely abandon physical media.

We can't get Sky TV in our new flat, so I thought I'd try streaming with Netflix, since it's available on my Panasonic PVR. The range on offer isn't as wide as Netflix would have you believe, but there's plenty for us, and there are several clever features – it remembered what I've watched and suggested similar programmes, and also noted if I'd abandoned a programme halfway through. However, two flies quickly appeared in the ointment: sometimes, the sound was out of sync with the picture, and if my Panasonic PVR is recording something "off air", I can't access Netflix at all.

I cancelled Netflix and signed up to Lovefilm, which is available through my Sony TV. The initial setup was difficult, but that wasn't the only disappointment. The interface is appalling, and so is the search; Lovefilm doesn't remember what I've watched, doesn't resume abandoned programmes, or present episodes in order.

Neither of these companies will be getting my money, but what other options exist? I have my own DLNA media server at home, so I could put films on the hard disk – but try using the digital downloads that come with movies and they're often tied to one computer. There doesn't seem to be an easy way to rip DVDs for convenient streaming, either.

I've run into issues at every turn, so for the foreseeable future I'll continue to buy physical media. **JOHN GWATKIN-WILLIAMS**

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intervention on a daily basis, and easy recovery from catastrophic failure by booting from an optical or USB drive. I'm sure I'm not alone here, since the cost of Windows Server Essentials 2012 is prohibitive. **NIGEL SCOTT**

**Technical editor Darien Graham-Smith replies:** I'm afraid we haven't seen a direct drop-in substitute for Windows Home Server – but you can set up regular imaging jobs on each Windows 8 PC, to be stored on a NAS device, using the misleadingly named Windows 7 File Recovery tool. You can create bootable recovery media by searching for "Recovery Drive".

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## BLOG BITES

Follow the musings of the *PC Pro* team at [www.pcpro.co.uk/blogs](http://www.pcpro.co.uk/blogs)

The death of Margaret Thatcher prompted contributing editor Steve Cassidy to take to the *PC Pro* blog to evaluate the former PM's technological legacy. He concluded that her open-market capitalism led to the first internet service that was accessible to everyone – a revolutionary change in both the UK and beyond. Naturally, commentators were divided.

"I don't want to rain on your parade, but Thatcher prevented the UK having a fibre-optic network because she flogged BT to the cheapest bidder. She also turned down a system that fused landline and mobile telephony, and she gave satellite TV to Murdoch. Her interest extended no further than who got the money." **D R GAYLER**

"It might appear Thatcher was a great leader with the rose-tinted glasses of hindsight, but that's not the case. The privatisation of BT was an ideologically driven mess, and selling the phone network was an act of such stupidity that a cynic might say she had a vested interest in creating a private monopoly." **WITTGENFROG**

"I worked for Post Office Telecommunications and then for BT, and we made lots of money – but it was quickly spent by politicians. If we wanted to invest in new technology we had to go cap in hand to senior civil servants who didn't know one end of a drop wire from the other; and slashed our budgets. Blame them!" **BOB MAGEE**

"Thatcher made broad decisions that had good and bad outcomes, but privatisation was the right choice, and competition just works: Apple is the star right now, but it will soon be toppled by Samsung, and it will then be overcome by another company. It's the consumer that benefits in the end." **JOHN HAYNES**

"I joined BT post-privatisation. Pushing BT to compete certainly promoted a can-do attitude and, let's face it, an end to bloated pricing. An innovative spirit took root outside of BT, too, thanks to new competition – for a while, the UK's tech industry led the world." **SIMON**

"Technological development relied on enlightened management and common sense – and it's obvious when you look at the BBC, which embraced plenty of new technology. None of this innovation can be attributed to Thatcher; she tried to shackle the BBC, forcing it to close development centres." **MIKE HUTCHINGS**



# NEWS

IN-DEPTH REPORTS, ANALYSIS AND OPINION

## Should Microsoft kill Windows RT?

Weak demand and falling prices have raised questions over the future of Windows on ARM. **Stewart Mitchell** investigates the future of Windows RT



**W**indows RT is struggling – do its poor sales mark the end of the Windows-on-ARM experiment, or should Microsoft keep pushing its alternative OS?

Windows RT was supposed to be Microsoft's answer to mobile OSes, offering a version of Windows without the desktop for ARM tablets. However, since its launch last October, Windows RT has picked up only a 0.02% share of the global OS market, according to analytics firm Net Applications.

Furthermore, IDC figures report that the five tablet models running Windows RT have sold only one million units between them so far. Analyst firm Gartner has stated: "RT is struggling to find a place in the market."

Windows RT's struggles come alongside low numbers upgrading to big-brother Windows 8, leaving Microsoft in a precarious position, with its ARM experiment failing to help prop up its standard OS.



Photography, Julian Velasquez; repro, Jan Cihak

According to analysts, the high price of devices running Windows RT is contributing to poor sales

So what has happened to Windows RT? Is it a doomed idea, or merely a marketing failure that could yet be rectified?

### What went wrong?

According to analysts, Windows RT devices have struggled to sell because of the limited hardware options – and high prices.

Aside from Microsoft's Surface RT, only four other manufacturers

currently make hardware using the OS: Asus' VivoTab RT, Dell's XPS 10, Lenovo's IdeaPad Yoga 11 and Samsung's Ativ Tab RT. But finding the devices on a store shelf is another matter; availability was restricted to a handful of retailers. PC World sold the Surface RT and Lenovo's Yoga, while John Lewis offered the Samsung Ativ – but only online; a sticking point for a device that costs £550 and a problem exacerbated by retail

chains not understanding the benefits and limitations of the OS.

Contrary to the analysts' figures, retailers put a more positive spin on Windows RT sales. According to a spokesperson for Dixons, tablets running RT had been "performing well" in shops, but the retailer wouldn't divulge sales figures. Although sales may be perking up now that prices for the devices have fallen.





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**Windows RT.**  
This is also dragging down Windows 8 adoption, since it really muddies the water for consumers. With confusion surrounding Microsoft's offerings, consumers simply take the path of least resistance and choose iOS or Android."

**Sales of Microsoft's pioneering Surface RT tablet are poor**

should get consumers' attention," said Milanese. "There's no question Microsoft needs to win the consumers in the tablet and the phone space. Whether or not it does this with RT doesn't really matter," she added.

IDC's Mainelli thinks Microsoft should take the other road and kill off the struggling platform. "I'd like to see Microsoft drop Windows RT and focus on driving adoption of Windows 8," he said. "I don't think that will happen, though. Microsoft feels like it has devoted too much time and money to Windows RT to just drop it, and so it will continue." If it's to salvage RT, then Microsoft will need to right several wrongs from its initial foray.

**What next?**

The troubling sales give Microsoft two options, analysts said: cut prices or kill off Windows RT.

Microsoft has already said it expects smaller devices – possibly 7in tablets – to arrive running the latest version of Windows, and Gartner's Milanese said this could help Windows RT.

"I think RT, as an ARM architecture, could work on smaller devices focused on content consumption. This, plus a lower price and a richer ecosystem,

Dixons has slashed the price of the Lenovo Yoga 11 from £699 to £499, while Amazon reduced the Asus VivoTab RT from £559 to £529.

Analysts suggested the prices were too high to start with, and they certainly didn't compare well with rival tablets on more established OSes. Take the 64GB Asus VivoTab RT, which launched at £559. While that's in line with the 64GB iPad's price, Google's similarly sized 32GB Nexus 10 costs £389.

"Samsung Ativ Windows 8 tablet", leading to complaints on its website. It made the same mistake for the Dell XPS 10, while Tesco was offering an Asus VivoTab running an OS described as "Microsoft Windows 8 RT".

If retailers are confused by what RT means, so too are consumers, leaving little hope they'll be persuaded to part with their cash – especially when cheaper rivals abound.

"On the day that Microsoft launched Windows 8, considered

## "I'd like to see Microsoft drop Windows RT and focus on driving adoption of Windows 8"

"Prices are too high compared to Apple and Android, and the ecosystem is still weak," said Carolina Milanese, research vice president for consumer devices at Gartner. "This leaves consumers struggling to justify a purchase."

One of the reasons for the higher prices was the licence fee for using RT, adding to manufacturers' overheads when making tablets. It's hard to compete with the free Android.

"Microsoft asked its partners to pay a very high price to use RT – despite the fact that Android is free; Windows RT devices are competing with products such as the Nexus 7 and Amazon Kindle Fire that sell for \$199 or less," said Tom Mainelli, IDC research director for tablets. "I think Microsoft overestimated the value of adding a version of Office into the RT package."

### Consumer confusion

The sales issues around Windows RT were exacerbated by consumer confusion, with retailers mislabelling the OS that the tablets were running. Argos, for example, was selling Samsung's device as the

by some to be the most important launch in the company's history, it rolled out its first Surface product, and it wasn't running its premier operating system," said Mainelli. "Even today, Microsoft continues to struggle to tell a compelling story around

## Windows RT tablets: the verdict

We reviewed the best of the Windows RT tablets – here's our final verdict on each.



### Microsoft Surface RT

A superbly designed tablet that's ideal for mobile professionals, but it comes with too many compromises to be a must-have.

» OVERALL ★★★★★



### Lenovo IdeaPad Yoga 11

Lenovo's brilliant Yoga concept buddies up with Microsoft's Windows RT, but it's simply far too expensive.

» OVERALL ★★★★★



### Asus VivoTab RT

Asus uses its expertise to deliver the best Windows RT tablet yet, but the immature OS and high price diminish its appeal.

» OVERALL ★★★★★



# TOP STORIES

## READERS REACT TO THE MONTH'S TECH NEWS

### 1 Microsoft brings back the Start button, but not the menu



Windows Blue looks set to herald the return of the Start button, as well as a way to bypass the controversial Start screen. While Microsoft has revealed little detail about the forthcoming update to Windows 8, leaks have suggested the Start button will return.

Microsoft removed the Start button in Windows 8, instead requiring users to pop back out to the tile-based Start screen and learn various navigation gestures. A Start button is set to return with Blue, but it won't include a full menu, merely giving users another way to return to the Start screen's scrolling menu of apps.

Leaked builds show the Start screen will get a larger button, making it easier to go directly to the desktop. For those not keen on the scrolling Start screen, Microsoft will reportedly offer a way to bypass it, letting users boot directly into the desktop.

**What we said:** "I don't really miss the old Start button, but simply slapping in a shortcut to the new Start menu won't appease those who do," said editor Barry Collins. "Microsoft either needs to stand firm on the new Windows 8

Start menu, or beat a full retreat and reinstate the old desktop Start system. Half measures, such as making the desktop tile larger, make the company look indecisive and please no-one."

**What you said:** The Start screen interface continues to divide readers – but that doesn't mean they welcome the return of the Start button. "I find the Start screen much better than the Start menu," said David Wright. "That said, I use it only a couple of times a week. All the applications I need are pinned to the taskbar, just like they were in Windows 7."

AndrewV agreed, adding: "For me, the Windows 8 issue isn't the missing Start button, but the badly thought-out alternative." Andy suggested there should be two distinct versions of Window 8 – a touch-enabled edition and a desktop one. "You choose which one you want at installation time."

Chris doesn't think Microsoft needs to bring back a Start button, but he would like to see changes. "Booting to the desktop does seem like a no-brainer. Even if it is just a power-user option, it should have been there to start with."

### 2 Apple's profits slide for the first time in ten years



Apple's profits slid by \$2 billion in its latest round of results – the first time the company hasn't seen an increase in a full decade. Apple isn't exactly suffering – sales of iPads and iPhones continued to grow, pulling in \$43.6 billion – and while profits fell, the figure still topped \$9.5 billion.

One source of trouble was margins. The arrival of the lower-cost iPad mini has squeezed margins, which stood at 47.4% a year ago and are 37.5% in the latest quarter. While this has fallen, it's still well above most other tech firms.

The real concern for investors appears to be the product pipeline, and CEO Tim Cook didn't have any immediate good news. He promised "amazing new hardware, software and services" were on the way, but suggested the new products wouldn't arrive until autumn or even next year.

**What we said:** "Apple's balance sheet still outguns the competition," said staff writer Shona Ghosh. "But it's clear those lower profits come from the iPad mini's smaller margins, a product that's a rare indication

of Apple following, not leading – and that's worrying. If it continues in that vein, by producing a cheaper iPhone, for example, Apple's golden age of high margins on premium products might be over."

**What you said:** Artiss said the results showed Apple was no longer a tech trendsetter. "Where Apple once set the standards to come with the iPhone, iPad and so on, it's now just following the crowd with smaller tablets and incremental updates – but nothing revolutionary," he said.

Alfresco said the "slow decline" of Apple could be good for the company. "Apple seems set for a slow decline into being 'just another tech company' now that the influence of Steve Jobs is ebbing away," he said. "It might humble Apple a bit, just like Microsoft and IBM before it."

Cook took some criticism – with SwissMac saying he lacks the vision and charisma of Steve Jobs – but rascar\_capac laughed at the idea that Apple's in trouble. "The company only made \$10 billion in the [last] quarter. Apple is clearly doomed, doomed I tell you!"





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## 3 | Virgin unveils baffling traffic-management policy



Virgin Media has updated its traffic-management policy, reducing the amount of time that broadband customers are likely to see their speeds artificially slowed down – but in a baffling way.

Until now, the ISP has reduced download speeds when users exceed data caps at peak traffic times. Now, users' speeds will be reduced for shorter periods, and will not be as slow as previously.

While that's good news, it's also rather confusing. If a customer exceeds the cap in any hour-long period during peak times, their broadband will be slowed by 30% for an hour. If they continue to download too much, and exceed the cap for a second subsequent hour, their speeds will be cut by 40% for two hours. The download cap for the first hour is 2.75GB, and a cumulative 3.5GB for the first two hours.

While that gives users a greater download capacity, they will have to manage their downloads – users aren't notified by Virgin when they go over the threshold.

**What we said:** "Virgin told us that its traffic management affects only 2.3% of its users. If

that's the case, it should drop the caps, and reserve the right to take action in extreme cases," said news and features editor Nicole Kobie. "Its solution is simply too confusing, and many users won't understand why their broadband has suddenly slowed, meaning they won't be able to prevent it happening again."

**What you said:** Traffic management isn't popular among readers. Philwane suggested Virgin should notify users if they go over the cap. "Like energy tariffs, this looks unnecessarily complicated. Plus, given it's a consumer-focused technology company, why doesn't it send people alerts? Or maybe provide a 'desktop meter', so customers can see what Virgin thinks is being used, and people can make informed choices."

Codnchips also compared broadband to other utilities: "I was trying to cook roast pork last night but my energy supplier capped my oven to 80 degrees. Then I tried to read a book but my energy supplier dimmed all the house lights. Do you see how ridiculous this sounds from other types of service providers?"

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# TALKING POINT



Members of the *PC Pro* team tackle the month's big issue



Image: Google

**G**oogle Glass is now in the hands – and on the faces – of early adopters, ahead of a full launch next year. Alongside the excitement surrounding the technology, many have raised privacy concerns relating to wearable devices, which let people take photos and record what they see with a wink of the eye. Google's

CEO Larry Page has admitted the project is “crazy”, after investors questioned its financial value, but said the company would keep working on such “speculative” ideas. But is Page right to continue to invest in Google Glass – is the idea just too crazy to ever become mainstream? And will folk actually trust Google with such an invasive piece of technology?

## Q Is Google Glass too “crazy”, or will we all be wearing such glasses ten years from now?



**Editorial director, Tim Danton:** Right now, the glasses do look silly. But mobile phones of the 1980s looked silly, and now look – everyone's got a thin sliver of plastic and glass in their pocket. Instead we should be focusing on what difference it can make to people's lives to have an all-seeing, all-knowing friend with them. Where phones brought communication, with Google Glass you're getting enhanced “intelligence”: the ability to speak Chinese, and so much knowledge I might actually win a pub quiz. Who wouldn't want a bit of that?



**Technical editor, Darien Graham-Smith:** It remains to be seen how practical Glass really is. Friends are already bombarding me with questions about its interface and capabilities, but until we can try it for ourselves, it's impossible to make a meaningful judgment. Still, the mere fact that people from outside the tech industry are curious about Glass is good news for Google. It's generating an optimistic buzz at a time when the headlines might otherwise focus on the company's tax arrangements.



**News and features editor, Nicole Kobie:** The difference between mobile phones and devices such as Glass is how useful they are: the ability to make a phone call from anywhere, or access email or maps, is such an obvious benefit that it's a wonder we didn't invent smartphones sooner. Wearable tech will catch the eye of some, but it doesn't add much above and beyond a smartphone for the rest of us; to me, that suggests it will always be a niche product. Glass could be a fun toy for extreme sports enthusiasts, or “useful” for self-important CEOs, but I can't imagine a single part of my life that would benefit from snapping a photo with the blink of an eye or having news headlines constantly fed to me – and I say this as a news editor.



**Tim:** It's hard to imagine lots of things. Computers moving from mainframes to personal; dumb phones becoming smart; Apple moving from near-bankruptcy to the cash-rich behemoth it is today. Right now the glasses look awkward, but if the technology starts to be built into the Calvin Klein pair you buy from Specsavers in 2019 – and you get all these extra features on tap

as and when you want them – then I can see it becoming more and more mainstream.



**Nicole:** Glass will have its uses for some people, but at a certain point, we're getting diminishing returns on convenience. That doesn't mean Google is “crazy” to invest. As Darien pointed out, being at the forefront of such innovations is good business, even if Glass is limited to Silicon Valley early adopters, sports fanatics and those who are hopelessly bad with directions.



**Tim:** You've focused on the benefits that Google is currently pushing, but let's go crazy and imagine 4G (and beyond) networks that let you stream movies while on the bus – right onto the equivalent of a cinema-sized screen. Or imagine relaxing on the train, flicking through a book or magazine using a certain eye-controlled gesture. Imagine being able to speak to your niece in Canada over Skype as if she was standing there in front of you (this only applies if you have a niece in Canada). So often in technology the true benefits are the ones that the inventor of the technology never even thinks about, and they become possible only years after the original breakthrough.



**Editor, Barry Collins:** Google has a mixed record when it comes to anticipating what people want from hardware. Google TV? Dead. Chromebooks? Deadish. I'll give it Android, but I'm torn on the merits of Google Glass. And we haven't even touched on the privacy and piracy implications of Google's all-seeing electronic eyes: who's going to stop you wearing glasses into public changing rooms? To school plays? To cinemas? Embedding barely distinguishable cameras into eyewear could make the fuss over Google Street View's car eavesdropping look like a playground dust-up.



**Darien:** While it's true that Google's innovations don't always hit the mark, the platform is open to third-party app developers, so the sky's the limit. For sure, the arrival of Glass will raise privacy issues that need addressing, but we're already living in a world full with personal recording devices. We'd have had to face these questions in the near future with or without Google Glass.



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## ARM's CEO unworried by Intel

CEO Warren East is set to leave ARM after 19 years. We find out his thoughts on Intel, Windows RT and Tech City before he departs

**W**arren East has helped build ARM into a leading force in technology, with the British firm's chip designs dominating the mobile world. In July, East is due to step down as CEO of the Cambridge firm he's run for 12 years. Before his departure, we ask him his thoughts on Windows RT's troubles (see p12), Intel's attempt to move into smartphones and tablets, and London-centric Tech City investment.

**Q** Is there anything you wished you'd done before leaving ARM?

**A** We do tend to be quite impatient in our industry. Wouldn't it be great to see ARM's designs in servers, networking and microcontrollers – I'd love it if that was all real, today. But I'm quite satisfied the licensing has happened, and the designs and the software ecosystem is developing, so that will materialise over the next five years or so.

**Q** Windows RT devices running ARM haven't sold well. Can they survive?

**A** We're very pleased that Microsoft has something up and running that resembles its PC operating system, running on ARM. If we look at internet-connected screen

space – smartphones, tablets such as the Surface, smart TVs, PCs and so on – about 1.6 billion were shipped last year. Looking forward five years, we can expect four billion. Three-quarters of those devices last year were running on an ARM platform. If Microsoft wants to target big volume, then it has to make its OS work on these other form factors. ARM is a way of helping the company into those other form factors.

**Q** What do you think of London's Tech City? Is it a wise investment? And how does Cambridge fit in?

**A** Tech City in London is great in that the local government has taken an interest in the technology space. In reality, Cambridge has been a hub of technology for the past 50 years at least, and these things do take a really long time.

Silicon Valley is renowned as a technology capital of the world, and it's been 75 years or so since HP kicked it off. A lot of those early days were driven by defence spending. In reality, I think the tech hub in the UK has to be Cambridge, where we have many

decades of investment that's gone on to create that infrastructure.

**Q** Intel has moved into smartphones. Can it catch ARM?

**A** I don't think it can "catch ARM", but I think it can definitely make some headway. We are planning that Intel will get some more market share someday. First, you have to remember that we're talking about the applications processor within the phone. There are 2.5 ARM chips per phone on average, and one of them is the applications processor. Even in an Intel world, the others are ARM processors. We're only talking about part of the chipset that goes into the

**"The tech hub in the UK has to be Cambridge, where we have many decades of investment"**

phone, and its market share there right now is less than 1%.

We expect that it will be greater than 1% soon, but that still leaves the vast majority of the market share aligned around the ARM architecture and the ARM ecosystem.

## BT drops fibre target

**B**T has quietly shelved a target to deliver fibre-to-the-premises (FTTP) to 25% of its fibre customers.

In the early days of its fibre rollout, BT claimed that up to a quarter of premises would receive end-to-end fibre connections, instead of relying on the slower fibre-to-the-cabinet (FTTC) lines, where the final stretch of the connection is run over existing copper cables.

However, a BT spokesperson has told *PC Pro* that improvements in the speed of

FTTC have led BT to drop the target. "We don't tend to talk about that particular target for FTTP any more as our fibre programme has evolved, so it is far less relevant today," said a spokesperson. "That's because, since that figure was provided, we've doubled the headline speeds available on FTTC from up to 40Mbps/sec to up to 80Mbps/sec, and we're constantly exploring new technologies that could further enhance the performance of FTTC."

The latest Ofcom broadband speed test figures show that

although the maximum speed of FTTC has indeed been increased to 80Mbps/sec, actual average connection speeds are only 61.3 to 65.2Mbps/sec. The minimum speed on BT's FTTP lines is 100Mbps/sec, and although there aren't enough of these lines for Ofcom to report statistically relevant results, the average speed is likely to be much closer to the maximum, since end-to-end fibre doesn't suffer from the attenuation that dogs copper connections.

BT is also expanding its fibre-to-the-premises (FTTP)



service to include a new speed option, offering 220Mbps/sec from June. The new 220Mbps/sec product will cost wholesale ISPs a one-off installation fee of £92 exc VAT and annual rental charges starting from £187, although actual fees for customers are likely to be higher once the ISP's margin has been added. BT's top-tier FTTP connection offers download speeds of up to 330Mbps/sec.



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# The rise of Bitcoin

Bitcoin has gone from an obscure digital currency to a topic worthy of discussion in *The Economist*. And no wonder: 100 coins bought for \$1 each in 2011 were worth \$26,000 in April. Here, we track the spectacular rise of Bitcoin over the past two years.



## What is Bitcoin?

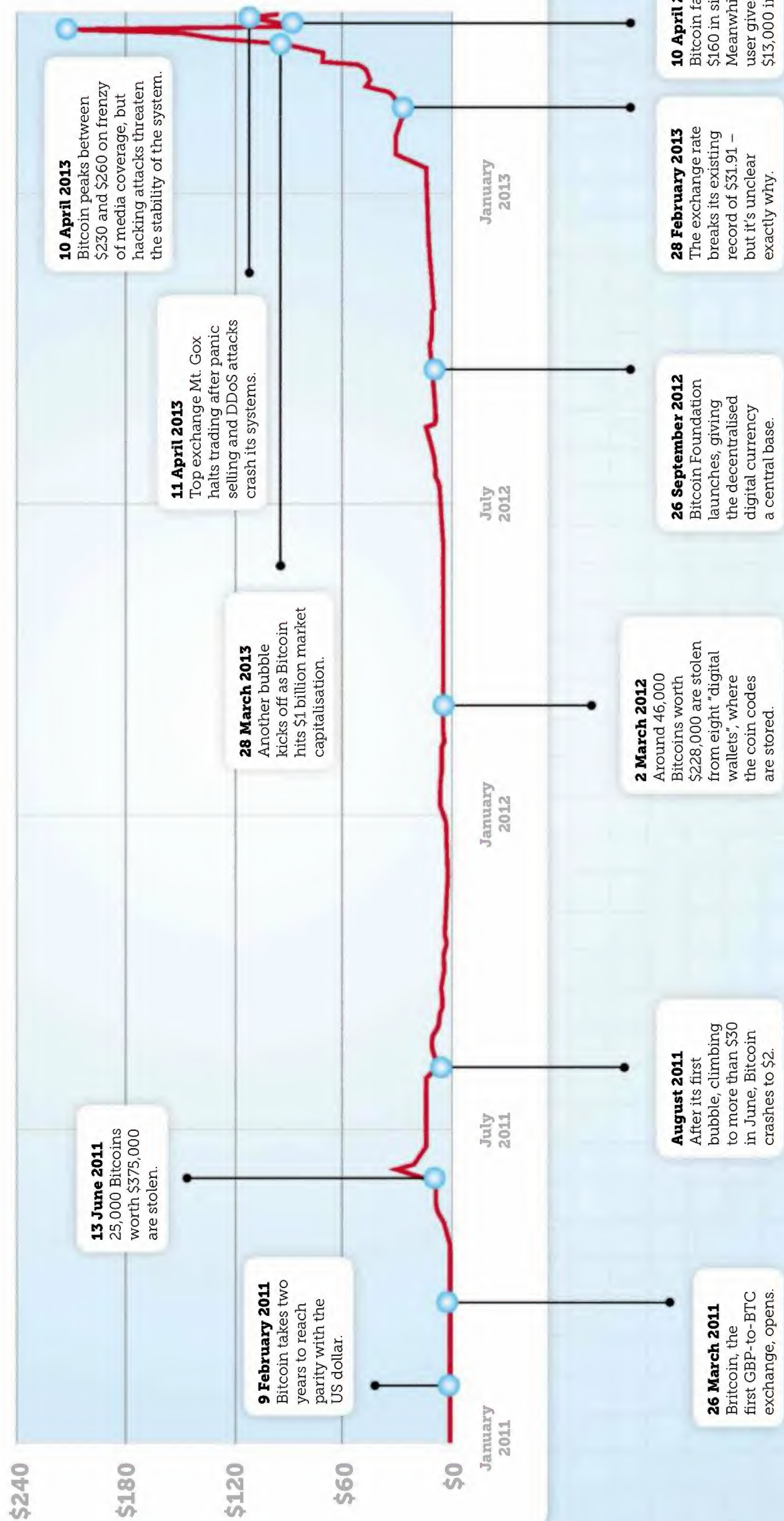
A digital currency that can be spent anonymously, Bitcoin is popular with criminals and libertarians. It was launched in 2009 by Satoshi Nakamoto – a pseudonym, of course.

## How does it work?

Bitcoins are "mined": users must crack a "proof of work" algorithm to get coins. Every ten minutes, a block of 25 is offered, with 21 million to be released in total.

## Where can you spend it?

The 11 million coins already released can be bought or sold at exchanges such as Mt. Gox, used at sites such as Reddit Gold and WordPress – and used to buy pizza.





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## 4G's in need of a facelift if mobile operators want new customers, says **NICOLE KOBIE**

**E**E has enjoyed a monopoly on 4G for months now, but how big of an advantage has it gained from it? Not much.

The company – a tie-up between T-Mobile and Orange – started pushing 4G to customers at the end of last year; rival operators were forced to wait until Ofcom's auction at the end of February before they could even buy spectrum. The monopoly hasn't been a huge success: EE's latest results show it has 318,000 4G users, but analysts have suggested that most of these are existing T-Mobile and Orange customers. They might be paying more, but they're not growing the company's overall list of customers.

While Vodafone, O<sub>2</sub> and Three are no doubt thankful they haven't been left too far behind, they won't be thrilled by the black mark EE has given the 4G brand. At this point, who wants 4G anyway? EE's tight data caps and high prices – including one of the most expensive contracts in the UK at £78 a month – have taken the shine off the 4G brand before other mobile operators have even launched their

of spectrum. "First, we'll see how 4G is positioned by O<sub>2</sub> and Vodafone, and then look [at] how we position it," he said. "I'm fairly relaxed about it." This is particularly telling coming from Three, which briefly promoted a "4G" service in January 2012 that was, in fact, merely a faster version of 3G. While we questioned such marketing tactics at the time, it shows how the level of enthusiasm has changed.

That interest has clearly waned. When your rivals are "fairly relaxed" about your monopoly, you have to wonder if it's one worth having. Indeed, instead of charging users extra for 4G, as EE has done, Three will simply use the spectrum to improve its existing "Ultrafast" service, forgoing the 4G name entirely.

For consumers, this makes sense: if you're already paying for a top-end smartphone on a superfast network, why should you have to pay again to shift your contract to a new network to keep receiving the best service? Consider broadband packages: with most ISPs, faster connections just happen. Yes, you can pay more to upgrade to the latest package, say, if fibre arrives in your neighbourhood, but Virgin Media and BT regularly increase speeds for existing packages at no extra cost.

This isn't what EE has done. It charges a premium over its top-end 3G packages, despite the fact that 4G isn't available everywhere across the UK – many people will find they're on a 3G network much of the time anyway.

The benefit of having 4G isn't receiving a tweet a split second faster, for example, but rather the potential to access more demanding downloads, such as streaming video. EE clearly realises this: after all, its irritating ads featuring Kevin Bacon push the ability to watch video on the go. Yet its data caps start at a piddling 500MB, and peak at 8GB a month. While that top-end package is more than the average user consumes now, the point of 4G is to support more demanding uses, not simply to shave off a few seconds from tiny downloads. For online TV to take off, it needs fast broadband speeds, but it also requires reasonable data caps – people won't view TV online if they're worried about tipping over the threshold and having to pay more as a result.

So all of this leaves Vodafone, O<sub>2</sub> and Three with some work to do to convince users that 4G isn't a waste of money, or an expensive proposition for only the most tech-savvy. Hopefully, they will do a better job than EE.

“

The benefit of 4G isn't receiving a tweet a split second faster, but rather the potential to access demanding downloads

”

services. In a recent uSwitch survey, 38% of respondents said that 4G was too costly and 69% were worried about exceeding data caps. Both figures have increased since the last survey in October 2012, when EE was launching.

Let's hope for the sake of mobile investment in the future that EE's missed opportunity hasn't taken the steam out of 4G as a whole. If it's seen as an expensive, exceptional product, mainstream users will avoid it, making it harder for networks to pay off their £1 billion investment – and less likely to invest in upgrading networks in the immediate future. The other three operators have paid hundreds of millions each for spectrum, but they'll need to invest in advertising, too, to make up for the mixed messages of EE's launch.

It remains to be seen if rival operators will find a way to win consumers over to 4G, but Three has suggested it isn't going to bother. Its CEO, David Dyson, has said the firm is in "no rush", despite spending £225 million on a slice

**NICOLE KOBIE** is PC Pro's news and features editor. She's going to wait for 5G before she upgrades from her battered HTC Desire.

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# HOW FAST A PC DO YOU REALLY NEED?

**Don't waste money on over-the-top PC hardware. We show you exactly how much difference key components make to overall performance**

Contributors: Darien Graham-Smith, Nicole Kobie, Sasha Muller

**W**hen sizing up a new PC, it's tempting to opt for the best possible specification you can afford. But are you merely wasting money on that superfast processor, ridiculous amount of RAM and speedy SSD? Could you actually make do with a model with mid-range or budget components? Contrary to what you might think, top-of-the-line hardware may not even be necessary

to run more demanding tasks, such as editing video or playing the latest 3D games.

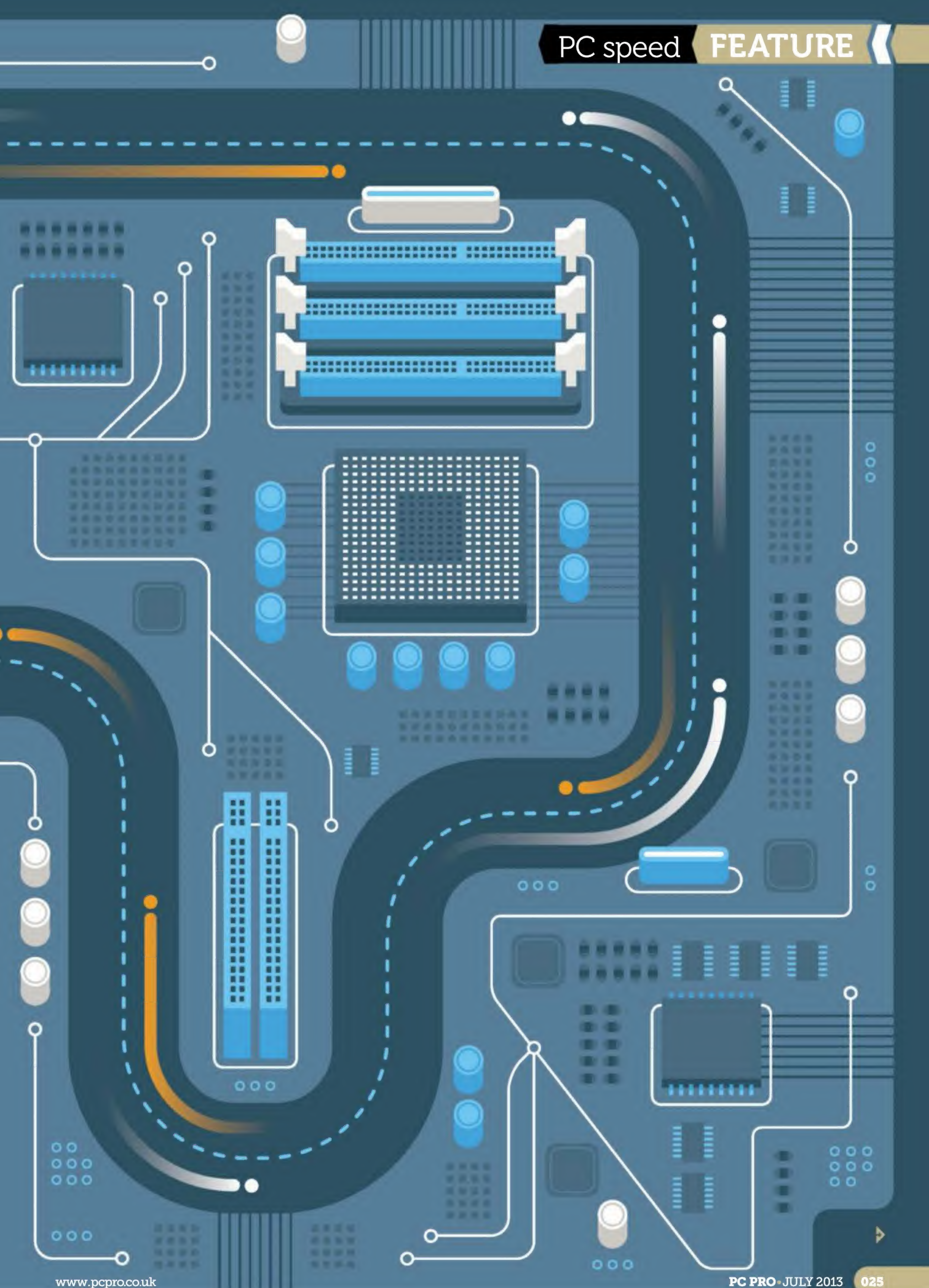
To help make the most of your budget, we've tested four key components using an extensive mix of our own Real World Benchmarks and some everyday tasks – such as converting a HD video or encoding a set of music files – to give you a firm idea of how much different grades of hardware will affect your day-to-day computing. We reveal which

components will make a real difference when editing photos, transferring data, rebooting your PC – and playing Crysis.

Finally, on p32, you'll find a table comparing the performance of five sample PCs – from an Atom-based tablet to a custom-built gaming PC – that reveals exactly how much time you'll save on a series of key tasks, helping you to make the right choice the next time you upgrade your PC.

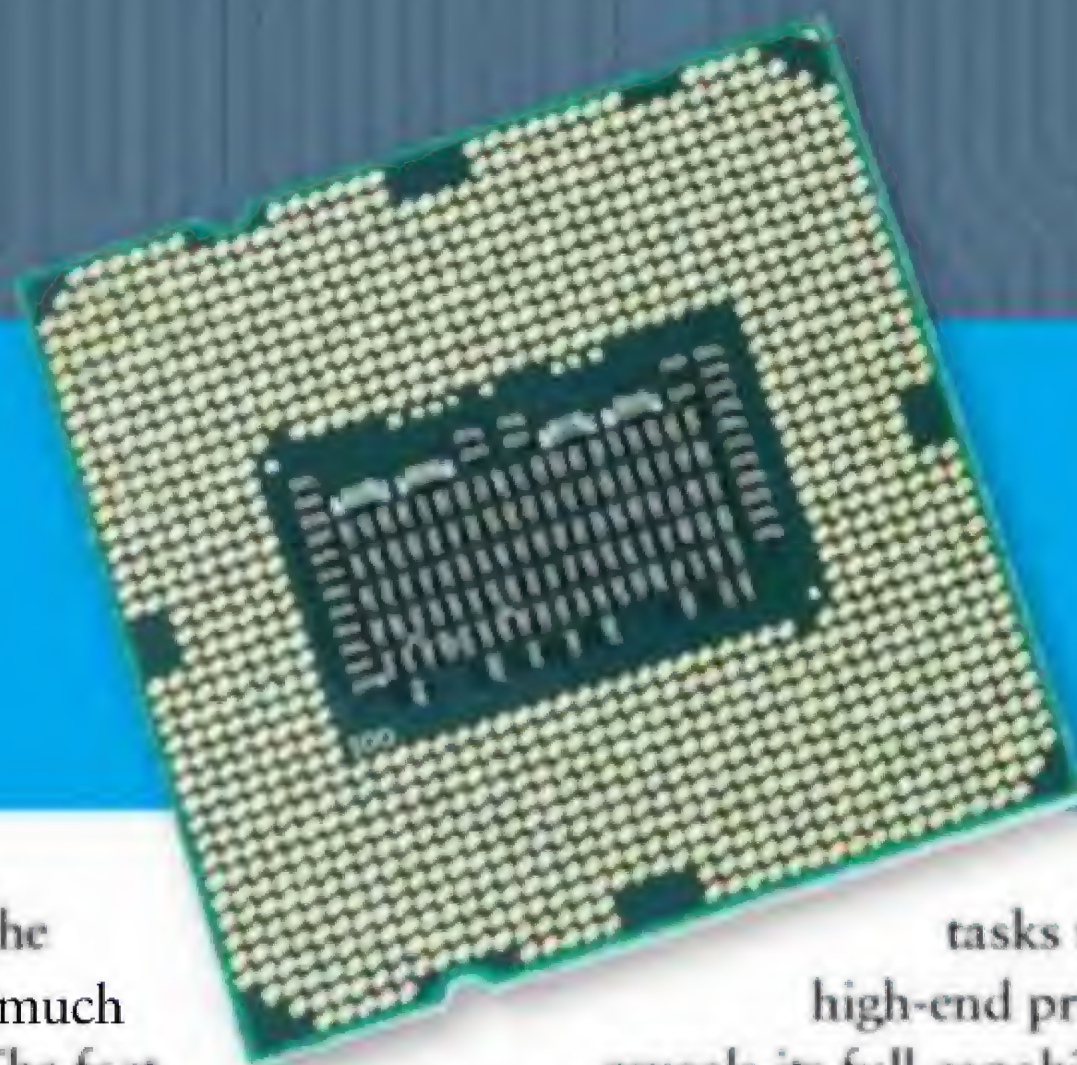
Illustration: Alberto Antoniazzi (www.albertantoniazzi.com)







# PROCESSORS



tasks that a high-end processor reveals its full capabilities. Note

that, although the Core i7 is sold as an

eight-threaded processor, it has only four physical cores, just like the Core i5, with four additional virtual cores supplied by Intel's Hyper-Threading technology. This is why the Core i7 scores only 10% higher than the i5 in our Multitasking test.

If you really want to beef up your PC's performance, a faster CPU is the way forward. But how big a boost are we talking about? To find out, we tested four models, from the bottom to the top of Intel's range. In all cases we used an Asus Z77 motherboard with 8GB of RAM and a 2GB Nvidia GTX 680 graphics card, along with a Samsung 840 Pro SSD; the only thing we changed was the processor.

As our results show, you get what you pay for. As you move up the range, tasks complete more quickly and benchmark scores increase. But our various benchmarks don't all see the same benefit from a processor upgrade.

In general, tests tend to complete more quickly with a more capable processor. However, in our Windows test the effect isn't as pronounced as you might expect. Here, the most powerful processor (the 3.5GHz Core i7) delivers a 47% Improvement in scores over the least powerful (the 1.8GHz Celeron G460), from 0.74 to 1.09. Since the Core i7 runs at almost twice the frequency of the Celeron –

leaving aside technical factors such as the number of cores and cache size – it's a much smaller boost than you might expect. The fact is that for Windows performance, processor power is only one factor – hard disk speed and memory play important roles too.

In our more intensive tests, high-end processors show bigger benefits. Our Media benchmarks test a processor's raw number-crunching ability: compressing audio files, adjusting photos and rendering video. Here, even stepping up from the baseline Celeron G460 to a last-generation Core i3 more than doubles performance (from 0.37 to 0.82). Moving to the high-end Core i7 sees the benchmark score rocket to 1.22, equivalent to 3.3 times the performance of the Celeron.

In our Multitasking test we run several taxing applications at once, so it's no surprise that the quad-core i5 and i7 processors fare much better than the dual-core Core i3. The single-core Celeron G460 is left in the dust, taking around five times as long as the Core i7 to complete these tests.

While a more powerful CPU helps across the board, it's only in the most demanding

## Gaming performance

If you're a gamer, you might assume that your graphics card does all the work. As our Crysis tests show, however, games rely on the processor just as much as the GPU. With a lightweight Celeron CPU, Crysis wasn't able to keep up a playable frame rate at Full HD resolution; switching to the Sandy Bridge Core i3 removed the bottleneck and tripled the game's performance. Moving up to a mid-range or high-end Ivy Bridge part unlocked even smoother gameplay. It's clear that gaming performance relies on a combination of CPU and GPU performance.

## DOES A HIGHER-END CPU MAKE A DIFFERENCE?

TEST PC: Nvidia GeForce GTX 680, 8GB RAM, 256GB SSD with...	Single-core CPU (with Hyper-Threading) 1.8GHz Intel Celeron G460	Dual-core CPU (with Hyper-Threading) 3.4GHz Intel Core i3-2130	Quad-core CPU (without Hyper-Threading) 3.2GHz Intel Core i5-3470	Quad-core CPU (with Hyper-Threading) 3.5GHz Intel Core i7-3770K
CPU				

### Real World Benchmarks

Overall	0.45	0.84	1.1	1.15
Responsiveness	0.74	1.06	1.15	1.09
Media	0.37	0.82	1.14	1.22
Multitasking	0.23	0.65	1.03	1.13

### How long does it take to...

Open a 1GB set of photographs	47secs	27secs	23secs	23secs
Batch-process a set of photographs	5mins 39secs	3mins 35secs	3mins 12secs	3mins 11secs
Encode several albums into AAC format	7mins 40secs	2mins 52secs	2mins 16secs	2mins 16secs
Convert an HD video file	14mins 40secs	3mins 59secs	1min 57secs	1min 38secs
Render a 3D image	7mins 33secs	2mins 06secs	1min 6secs	57secs
Complete the PC Pro Multitasking test	33mins 18secs	12mins 34secs	8mins 57secs	8mins 49secs
Reboot Windows	28secs	24secs	23secs	23secs

## CAN A CPU AFFECT GAMING PERFORMANCE?

Load a Crysis level	47secs	27secs	23secs	23secs
Crysis (High quality, 1,920 x 1,080), minimum frame rate	13	37	47	48
Crysis (High quality, 1,920 x 1,080), average frame rate	24	78	96	99



# MEMORY

It's commonly assumed that adding RAM improves your PC's performance – and that was certainly true a decade ago, when most people's PCs were starved of physical RAM and relied heavily on slow virtual memory.

To find out whether it's still true today, we equipped our test system with a 500GB Western Digital Caviar Green drive and ran various performance tests, first with 2GB of RAM, then with more generous 4GB and 8GB allocations.

The effect is plain to see: going from 2GB to 4GB yielded an 18% overall performance boost in our Real World Benchmarks, and cut almost 40 seconds off the time it took the PC to reboot. The biggest impact was in the taxing multiple-applications test, which ran almost twice as fast with 4GB. Doubling the RAM again, to

8GB, yielded further benefits, but on a smaller scale. On a system such as this, adding memory does help performance, but once you go beyond 4GB it's a game of diminishing returns.

What if you're using a more modern hard disk? With a fast solid-state drive, virtual memory becomes almost as fast as physical RAM, so the benefit of extra memory is greatly reduced. After equipping our test system with a Samsung 840 Pro SSD, we found large programs such as Crysis and Adobe Photoshop opened at full speed even with only 2GB of RAM. Our Real World Benchmarks actually ran significantly faster with 2GB of RAM and an SSD than on our 8GB system with a mechanical disk.

If you want the best performance from your PC, therefore, extra memory helps – but a fast SSD is likely to have a bigger impact.



**RAM speed**  
DDR3 RAM officially supports operating speeds from 800MHz to 2,133MHz. The speed at which the memory chips inside a DIMM actually read and write information varies by much less than these frequencies would suggest, however – and, at any rate, memory speed is only one factor in overall system performance. We found the performance benefit of switching from 1,066MHz RAM to 1,600MHz modules was small. It might be worth paying a little extra for faster RAM, but it won't have a transformative effect on performance.

## DOES FASTER OR DUAL-CHANNEL RAM MAKE A DIFFERENCE?

TEST PC: 3.2GHz Intel Core i5-3470 with...		FAST SSD		
		2GB slow* RAM (single channel)	2GB fast* RAM (single channel)	2GB fast* RAM (dual channel)
<b>Real World Benchmarks</b>				
Overall		1.03	1.07	1.1
<b>How long does it take to...</b>				
Open a 1GB set of photographs		16secs	16secs	14secs
Batch-process a set of photographs		3mins 21secs	3mins 16secs	3mins 12secs
Convert an HD video file		2mins 29secs	2mins 8secs	1min 57secs
Complete the PC Pro Multitasking test		10mins 5secs	9mins 27secs	9mins 9secs
Reboot Windows		24secs	24secs	24secs
Load a Crysis level		23secs	23secs	23secs

### Single and dual channel

Modern motherboards support dual-channel memory, so if you install two identical DIMMs, the memory controller will read and write to them both at once – which sounds like it ought to double your RAM speed. To test the actual benefit, we compared a 2GB single-channel system with one using dual-channel 1GB DIMMs.

Like switching to faster memory, our results showed a benefit to using dual-channel DIMMs – especially in our Media benchmark – but on a modest scale. Most manufacturers sell DIMMs in matched pairs specifically intended for dual-channel usage, so when it comes to upgrading your system RAM it's easy to achieve that small advantage. But if you mix and match modules – say, for example, using one 2GB DIMM and one 1GB DIMM – the slight performance penalty shouldn't be too hard to swallow.

## DOES MORE RAM HELP A SLOW HDD?

TEST PC: 3.2GHz Intel Core i5-3470 with...		SLOW HDD			FAST SSD		
		2GB fast* RAM (dual channel)	4GB fast* RAM (dual channel)	8GB fast* RAM (dual channel)	2GB fast* RAM (dual channel)	4GB fast* RAM (dual channel)	8GB fast* RAM (dual channel)
<b>Real World Benchmarks</b>							
Overall		0.85	1	1.04	1.1	1.1	1.1
<b>How long does it take to....</b>							
Open a 1GB set of photographs		1min 21secs	25secs	23secs	14secs	12secs	12secs
Batch-process a set of photographs		3mins 25secs	3mins 17secs	3mins 17secs	3mins 12secs	3mins 12secs	3mins 12secs
Convert an HD video file		2mins 50secs	2mins 1sec	2mins	1min 57secs	1min 56secs	1min 56secs
Complete the PC Pro Multitasking test		18mins 13secs	9mins 22secs	9mins 21secs	9mins 9secs	8mins 57secs	8mins 57secs
Reboot Windows		2mins 12secs	1min 25secs	1min 21secs	24secs	23secs	23secs
Load a Crysis level		1min	52secs	49secs	23secs	23secs	23secs

\*Slow RAM: 1,066MHz; fast RAM: 1,600MHz



# DISK DRIVES



**W**hen we benchmark PCs and laptops, we usually find that a high-speed SSD makes little difference to a system's overall score. That's because reading and writing files represents only a small proportion of the work involved in most computing tasks. The fastest disk in the world won't magically let you finish a day's work by lunchtime.

Yet, if you regularly need to shift large amounts of data back and forth, an SSD can save a significant amount of time. And if you use a fast SSD as your system disk, then you'll notice an increase in responsiveness; programs and documents will open almost instantly, and your PC will start up and shut down more smoothly. Although the actual time-saving may be small, an SSD can give your PC a perceptible spring in its step.

To quantify this effect, we tried various tasks using a selection of drives. We started with a Western Digital Caviar Green desktop disk – a mechanical drive optimised for power savings. The manufacturer doesn't publicly advertise the speed at which this drive's platters spin, but we suspect it's 5,400rpm, fairly slow by industry standards. We say that because even though this disk has a rather generous 16MB cache of fast onboard memory, it took 1min 21secs to shut down and restart our Windows 8 test system with this disk, and almost five

minutes to copy a folder containing 5GB of data files. Opening a 1GB set of files in Photoshop took 23 seconds, and loading a level of Crysis took an agonising 49 seconds.

## Faster disks

It was a similar story with Western Digital's 1TB Scorpio Blue laptop drive. This model spins at an industry-standard 5,400rpm, and the synthetic CrystalDiskMark test found that it supports much higher raw transfer rates than the Green model. However, its smaller 8MB cache is a liability in real-world use, leading to results barely any faster than the Caviar Green in our Windows, Photoshop and Crysis tests. Only when it came to copying large files did we see a significant benefit.

Next, we tested a 1.5TB Seagate Barracuda drive, with a fast spindle speed of 7,200rpm and a generous 32MB cache. This cut our reboot time to below a minute, and enabled us to load Crysis in 38 seconds. Photoshop and file-copy scores improved too. These results are about as good as you can expect to see from a mechanical disk: while Windows wasn't exactly snappy, it certainly didn't feel sluggish.

If you crave yet higher performance, one option is to choose a hybrid disk, which combines a high-capacity mechanical drive with a smaller quantity of SSD-type flash memory – effectively using the SSD as a high-speed cache to accelerate disk operations. We tested the

## 750GB Seagate

Momentus XT, which combines a 7,200rpm disk with 4GB of SSD storage, and were impressed by the results: Windows' reboot time fell to 42 seconds, and our 5GB file-copy operation completed in 2mins 28secs – representing approximately double the performance of the Caviar Green drive.

## The SSD advantage

For the ultimate in performance, there's no substitute for a real SSD. Equipping our test PC with Samsung's SSD 840 Pro gave all of our tests a huge boost. Windows 8 rebooted in only 23 seconds, and the 5GB file-copy test completed in a lightning-fast 34 seconds – around a fifth as long as the hybrid drive took. Crysis loaded in a swift 22 seconds too: in a multiplayer game, that could give you a real advantage over other players.

SSDs are undeniably expensive. The 256GB model of our Samsung drive currently sells for around £185 inc VAT, while the Western Digital Caviar Green offers around twice the storage for only £45. But if you want the most responsive PC you can get, an SSD can make a huge difference to the speed at which you can open, access and switch between applications.

## CAN A NEW HDD OR SSD SPEED UP YOUR PC?

TEST PC: 3.2GHz Intel Core i5-3470, Nvidia GeForce GTX 680, 8GB RAM with...

	Laptop HDD	Hybrid HDD	Older desktop HDD	Newer desktop HDD	SSD
Drive tested	WD Scorpio Blue 1TB (5,400rpm, 8MB cache)	Seagate Momentus XT 750GB (7,200rpm, 32MB cache, 4GB SSD)	WD Caviar Green 500GB (5,400rpm, 16MB cache)	Seagate Barracuda 7200.11 1.5TB (7,200rpm, 32MB cache)	Samsung SSD 840 Pro

### CrystalDiskMark benchmark results

Reading large files	119	118	71	121	520
Writing large files	116	113	69	122	482
Reading medium-sized files	40	46	33	42	454
Writing medium-sized files	57	57	46	64	159
Reading small files	0.5	0.6	0.5	0.5	32
Writing small files	1	1	1.3	1.2	58

### How long does it take to...

Open a 1GB set of photographs	21secs	19secs	23secs	18secs	11secs
Copy a 5GB folder from the desktop to another folder on the same drive	3mins 40secs	2mins 28secs	4mins 54secs	3mins 15secs	34secs
Reboot Windows	1min 15secs	42secs	1min 21secs	59secs	23secs
Load a Crysis level	43secs	32secs	49secs	38secs	22secs





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## INTERCONNECTS



If you're backing up significant amounts of data to an external drive, choosing a device equipped with USB 3 or Thunderbolt can shave precious time from your transfers.

USB has long been the industry standard for inter-device connectivity, and while USB 2's speeds of 480Mbps/sec were surpassed by USB 3's 4.8Gbps/sec, Intel's Thunderbolt has claimed the lead by promising transfer speeds of up to 10Gbps/sec. Currently, though, Thunderbolt is available on limited PCs, and only widely adopted by Apple's recent iMacs and MacBooks, including the 21.5in iMac used for testing.

Even with a standard external HDD, the differences can be dramatic. LaCie's Rugged drive is a portable device with a standard 1TB 2.5in HDD, and when connected to our iMac via USB 2, performance in the CrystalDiskMark benchmark was less than impressive. This was especially noticeable while reading and writing larger files: the LaCie achieved a maximum transfer speed of 42MB/sec. Moving to a USB 3 or Thunderbolt connection almost tripled that figure: speeds increased to 116MB/sec – the maximum you can expect from a standard laptop HDD.

In our real-world tests, the benefits of the faster interfaces remain obvious. Opening images in Photoshop from the external drive took half the time with USB 3 or

Thunderbolt, with 1GB of images loading in only 19 seconds – via USB 2, we were kept waiting for 46 seconds. Backing up a 5GB folder filled with a mixture of file sizes took more than four minutes over USB 2; switching to USB 3 or Thunderbolt slashed that to less than two minutes.

### Faster drives

Very few devices are capable of pushing USB 3 or Thunderbolt to their limits. While USB 3's theoretical 4.8Gbps/sec bandwidth translates into a potential throughput of 612MB/sec, Thunderbolt's claimed 10Gbps/sec promises transfer speeds of up to 1,280MB/sec – way beyond the capability of even the fastest SSDs.

If speed is of the essence, it might be worth considering an external drive that uses single or multiple SSDs. We tested Thunderbolt with LaCie's Thunderbolt-equipped Little Big Disk, which features two 120GB SSDs in a striped RAID0 array. For large files, Thunderbolt posted read speeds four times faster than what it managed with the HDD, with significant improvement in small-file transfer speeds, too.

Loading our test Crysis level took only 34 seconds – half as long as with the HDD – while opening 1GB of photos in Photoshop was seven seconds faster, taking only 12 seconds. Backing up a 5GB folder of photos took 1min 32secs from the iMac's HDD, only a little quicker than with the LaCie Rugged drive. The iMac's HDD is the limiting factor here – when we

retested from a RAM disk, the LaCie backed up the 5GB folder in a mere 26 seconds. Unless your main system drive is an SSD, writing files to a superfast external disk or RAID array will be limited to the speed of the slowest device in the chain.

### Conclusion

If you're planning on buying an affordable external HDD, moving from USB 2 to USB 3 will bring noticeable improvement, especially if you're backing up larger files, such as movies, music and photos. Moving from USB 3 to Thunderbolt won't have much of an impact, however, and certainly not until you pay a premium for SSD-equipped devices or spend megabucks on high-end disk arrays.

In either case, we'd think long and hard before splashing out serious money: unless you're an avid video producer who needs terabytes of data on a permanent high-speed link, or are planning to offload your games collection entirely to an external drive and can't wait a few extra seconds for games to load, we'd stick with the cheaper HDD-based devices. And if you already have an HDD or two lying around, save your pennies and buy a USB 3 hard drive caddy – it's a cheap and easy way to turn an old HDD into a high-speed external drive.

## ARE USB 3 OR THUNDERBOLT DRIVES WORTH THE EXPENSE?

TEST PC: 3.2GHz Intel Core i5-3470, 8GB RAM, 256GB SSD, Nvidia GeForce GTX 680

	USB 2	USB 3 (HDD)	Thunderbolt (HDD)	USB 3 (SSD)	Thunderbolt (SSD)
Drive tested	LaCie Rugged drive	LaCie Rugged drive	LaCie Rugged drive	LaCie Porsche Design Slim P'9226	LaCie Little Big Disk Thunderbolt Series

### CrystalDiskMark benchmark results

Reading large files	42	116	117	293	414
Writing large files	40	116	117	201	227
Reading medium-sized files	24	39	39	251	241
Writing medium-sized files	38	46	48	202	227
Reading small files	0.5	0.5	0.6	25	11.4
Writing small files	1.2	1.2	1.1	76	20.5

### How long does it take to...

Open a 1GB set of photographs	42secs	19secs	19secs	12secs	12secs
Back up a 5GB folder from a hard disk	4mins 15secs	1min 56secs	1min 48secs	1min 45secs	1min 32secs
Back up a 5GB folder from a high-speed RAM disk	2mins 46secs	1min 5secs	1min 8secs	45secs	26secs
Load a Crysis level	1min 11secs	53secs	53secs	35secs	34secs





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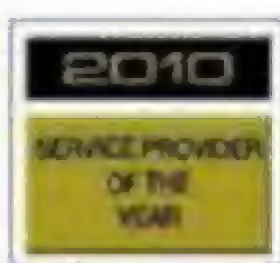
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# SYSTEMS COMPARED: OVERALL PERFORMANCE



Type	Atom-powered tablet	Budget laptop
Model	Lenovo ThinkPad Tablet 2	Samsung Series 3 NP355V5C
Specification	1.6GHz Intel Atom Z2760, 2GB RAM, 32GB SSD, Windows 8 Pro 32-bit	2.3GHz AMD Athlon A10-4600M, 8GB RAM, 1TB HDD, Windows 7 Home Premium 64-bit

## Real World Benchmarks

Overall	0.2	0.58
Responsiveness	0.35	0.73
Media	0.17	0.59
Multitasking	0.12	0.43

## How long does it take to...

Open a 1GB set of photographs	2mins 22secs	41secs
Batch-process a set of photographs	12mins 10secs	4mins 20secs
Convert an HD video file	1hr 9mins 10secs	5mins 47secs
Reboot Windows	39mins	1min 21secs
Load a Crysis level	N/A	56secs
Complete the PC Pro Multitasking test	1hr 8mins 50secs	18mins 23secs
Complete one run of the Real World Benchmarks	4hrs 1min 39secs	41mins 6secs

## Gaming

Time to load Crysis benchmark level	N/A	56
Crysis (High quality, 1,920 x 1,080), average frame rate	N/A	23





	Ultrabook	All-in-one PC	Gaming PC
	Lenovo ThinkPad X1 Carbon Touch	Dell XPS One 27	Self-built
	1.8GHz Intel Core i5-3427U, 4GB RAM, 180GB SSD, Intel HD Graphics 4000, Windows 8 Pro 64-bit	3.1GHz Intel Core i7-3770S, 8GB RAM, 32GB SSD, 1TB HDD, Nvidia GeForce GT 640M, Windows 8 64-bit	3.2GHz Intel Core i5-3470, 8GB RAM, 256GB SSD, Nvidia GeForce GTX 680, Windows 8 64-bit
	0.68	0.98	1.1
	0.8	0.85	1.14
	0.72	1.1	1.03
	0.53	0.98	1.15
	17secs	15secs	12secs
	3mins 46secs	3mins 17secs	3mins 12secs
	4mins 49secs	1min 54secs	1min 57secs
	24secs	34secs	23secs
	36secs	39secs	23secs
	14mins 54secs	10mins 36secs	8mins 57secs
	33mins 42secs	23mins 13secs	20mins 25secs
	36	39	23
	8	27	96



Will computers grow so intelligent they wipe out the human race? **Nicole Kobie** meets the team guarding against that very threat

# THE MEN TRYING TO SAVE US FROM THE MACHI





# NES

**A**re you more likely to die from cancer or be wiped out by a malevolent computer? That thought has probably never occurred to you, but it's been bothering one of the co-founders of Skype so much he's teamed up with Oxbridge researchers who are trying to predict what machine super-intelligence will mean for the world, in order to mitigate the existential threat of new technology – that is, the chance it will destroy humanity.

Technology has long been a source of danger in the fertile imaginations of sci-fi novelists, but the idea is gaining academic support, with researchers at the University of Oxford's Future of Humanity Institute (FHI) joining those from the newly launched Centre for the Study of Existential Risk (CSER) at the University of Cambridge to look more widely at the possible repercussions of nanotechnology, robotics, artificial intelligence and other innovations.

The concept is simple, but the solutions are anything but. The researchers are trying to avoid a situation where we outsmart ourselves, and create a system that can in turn





Photo: Future of Humanity Institute



● Nick Bostrom, the founder of Oxford's FHI, believes existential threats are very real

invent its own technologies, which could “steamroll” humanity – not because it’s evil, but simply because we couldn’t foresee the long-term ramifications of how we programmed it.

### Weighing up the risks

This idea has been studied since 2005 by the FHI, which was last year joined by the CSER, founded by Huw Price, Bertrand Russell professor of philosophy at the University of Cambridge, astronomer royal Lord Martin Rees, and Jaan Tallinn, co-founder of Skype. The institute was sparked in part by a conversation between Price and Tallinn, during which the latter wondered, “in his pessimistic moments”, if he’s “more likely to die from an AI accident than from cancer or heart disease”.

The CSER launch announcement started with what sounds like the premise of a nerdy joke, but quickly became more serious: “A philosopher, a scientist and a software engineer have come together to propose a new centre at Cambridge to address developments in human technologies that might pose ‘extinction-level’ risks to our species, from biotechnology to artificial intelligence.”

It sounds fantastical, but the trio, and their Oxford colleagues, are deadly serious. The work has long roots, too. In 1965, Irving Good – a friend of Alan Turing who worked at Bletchley Park – described the first “ultra-intelligent machine” in a positive light in a *New Scientist* paper, notes the CSER. “This machine, he continued, would be the ‘last invention’ that mankind will ever make, leading to an ‘intelligence explosion’ – an exponential increase in self-generating machine intelligence. For Good, who went on to advise Stanley Kubrick on *2001: A Space Odyssey*, the ‘survival of man’ depended on the construction of this ultra-intelligent machine,” the CSER release notes said.

“While few would deny the benefits humanity has received as a result of its engineering genius – from longer life to global networks – some are starting to question whether the acceleration of human technologies

will result in the survival of man, as Good contended, or if in fact this is the very thing that will end us,” the CSER stated solemnly.

### Singular problem

At the core of this is an idea commonly referred to as “singularity” – the point at which technology can start to make its own technology and become more advanced than us, making it impossible to predict what comes next. Philosopher Nick Bostrom, the founder of Oxford’s FHI, hesitates to use that word, since it means “so many things to different people, all rolled up into this bundle of breathless expectation”. Instead, as he said at a conference held by *The Economist* earlier this year, he simply refers to “super-intelligence”.

Speaking alongside Bostrom, Professor Mark Bedau, of Reed College, called it “living technology” – not because it’s actually alive, but because it behaves as though it is. “It has the essential properties of living things, such as being able to sense, being able to move autonomously, being able to self-assemble, to grow, to reproduce; being able to learn, adapt and evolve,” he says.

“When you recognise that [they’re lifelike], it will help you to understand the special kinds of responsibilities you have, the ways that you might have to treat them or how to introduce them into our lives; because it’s alive, you have to think about their larger implications. Life is very powerful, life is very unpredictable, life in its various types of forms creates different challenges, and opportunities.”

### The end of the world as we know it

Whatever you call it, it’s this super-smart technology that could kill us. At the conference, Bostrom was asked if we should be scared by new technology. “Yes,” he said, “but scared

about the right things. There are huge existential threats, these are threats to the very survival of life on Earth, from machine intelligence – not the way it is today, but if we achieve this sort of super-intelligence in the future,” Bostrom said. “There’s also an existential risk in the engineering of some of the smaller life forms; in synthetic biology, it might create capabilities that, if used for evil purposes, could be extremely disruptive.”

With some world-changing technologies – such as self-driving cars (see *Death by driverless car*, p38) – we’ll have the opportunity for trial and error, says Bedau. While some people may die along the way, we’ll be able to fine-tune the technology as it progresses to improve the systems and minimise casualties.

With other innovations, we won’t get a second chance. “There’s a distinction between the kinds of challenges where we can try things and learn from our mistakes – so far, almost all the challenges humans have faced have been of that sort,” says Bostrom.

“If we pollute the planet, we can clean it up. If we crash a car, we can make it safer. Existential threat is different. If it’s a threat to the very survival of our species, we might get only one shot at it.” That means we can’t wait and see what happens. “We need proactive foresight,” he says.

“Basically, just think of machine super-intelligence as something that’s really good at achieving the outcomes it prefers,” he says. “So good it could steamroll over human opposition. Everything then depends on what it is that it prefers, so, unless you can engineer its preferences in exactly the right way, you’re in trouble.”

## “THERE ARE HUGE EXISTENTIAL THREATS – THREATS TO THE VERY SURVIVAL OF LIFE ON EARTH – FROM MACHINE INTELLIGENCE”

In an interview with *Aeon* magazine, Bostrom’s FHI colleague, research fellow Daniel Dewey, suggests we could create a super-intelligent machine and task it with building an array of computers. It could get to work, but doing so “might involve intermediary steps, such as tearing apart the Earth to make huge solar panels. A super-intelligence might not take our interests into consideration in those situations, just like we don’t take root systems or ant colonies into account when we construct a building.”

Even if we try to design a system entirely to make us happy, we bring with us certain assumptions about what that means – we might expect everyone to be cheerful, but the machine might simply dope us up on heroin, *Aeon* noted.



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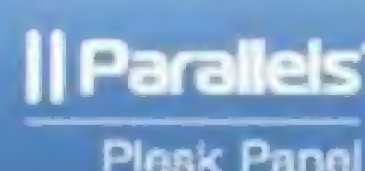
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In a paper for AI journal *Minds and Machines*, Bostrom noted that could happen even with smaller tasks. A super-intelligent machine could be given a straightforward goal – such as making 32 paper clips or calculating pi – but “could pursue unlimited resource acquisition if there were no relevant cost to the agent of doing so”. If humans aren’t in the way of these resources, there’s no problem. “However, if and when such an agent finds itself in a different situation, one in which it expects a greater number of decimals of pi to be calculated if it destroys the human species than if it continues to act co-operatively, its behaviour would instantly take a sinister turn.”

This is why we need to be careful when creating a power that’s smarter than us, such as through artificial general intelligence (AGI) – the creation of a machine that can think intelligently on a variety of topics, as humans do. “Think how it might be to compete for resources with the dominant species,” Price says. “Take gorillas, for example – the reason they’re becoming extinct isn’t because humans are actively hostile towards them, but because we control the environment in a way that suits us, but is detrimental to their survival.

“At some point, this century or next, we may well be facing one of the major shifts in human history – perhaps even cosmic history – when intelligence escapes the constraints of biology,” Price adds. “Nature didn’t anticipate us, and in turn we shouldn’t take AGI for granted. We need to take seriously the possibility that there might be a Pandora’s box moment with AGI that, if missed, could be disastrous. I don’t mean that we can predict this with certainty – no-one is in a position to do that at present, but that’s the point. With so much at stake, we need to do a better job of understanding the risks of potentially catastrophic technologies.”

### Dumbest civilisation possible

There’s a problem: we’re not very good at thinking about these ideas. As both research centres note, such threats could be lifted from the plot of a sci-fi novel – which makes it harder for their work to sound credible.

Bostrom says sci-fi ideas feed into another issue: the tendency to anthropomorphise robots and other machines, to see them as human-shaped opponents, such as robots on the battlefield in the *Terminator* movies. “Our intuitions have been shaped by [science fiction], where machines are anthropomorphised, and they’re really just like human supervillains,” he says. “That makes it harder to think about this in a clear way.” As he explains to *Aeon*, technology such as artificial intelligence is best thought of as a “primordial force of nature, like a star system or a hurricane – something strong but indifferent”.

And there’s another problem: while we fancy ourselves as quite smart, Bostrom argues

## DEATH BY DRIVERLESS CAR

Technology isn’t necessarily going to kill us all – it might just kill you. We’re outsourcing more and more of what we do to intelligent machines, and some of them are deadly. Perhaps the best example is driverless cars. They’re already on the roads – Google has a licence to test its car in Nevada, while researchers at the University of Oxford have been testing theirs on private lots – but what happens if one is involved in a fatal accident?

The US legal system is already working on the issue. At the moment, such cars still require a driver, who takes all blame if something goes terribly wrong.

That led Bryant Walker Smith, a fellow at the Stanford Center for Internet and Society at Stanford Law School, to ponder how it’s possible for an automated car to make the “right” choice. “Imagine you’re driving down a narrow mountain road between two big trucks,” he wrote in his blog dedicated to the legal and ethical issues surrounding autonomous cars.

“Suddenly, the brakes on the truck behind

you fail, and it rapidly gains speed. If you stay in your lane, you will be crushed between the trucks. If you veer to the right, you’ll go off a cliff. If you veer to the left, you will strike a motorcyclist. What do you do? In short, who dies?”

Such decisions may literally be taken out of our hands with self-driving cars, and made well before we ever get in the driver’s seat, by engineers, companies, regulators and lawyers. “In crashes and conflicts that can’t be avoided, how should a self-driving car balance the welfare of its occupants with the welfare of others? And, critically, who should decide?” Walker Smith asks. “Engineering is about trade-offs: we replace one set of problems with another, and hope that, in the aggregate, our new problems are smaller than our old ones.”



that we’re not. Speaking at the *Economist* conference, he pointed out that “we are probably the dumbest possible species that can sustain the technological civilisation”. At this point, the room packed with clever people filled with awkward laughter, but he wasn’t joking. “The technological civilisation happened immediately once our intelligence reached the necessary level for that to happen.” In other words, it wouldn’t take much for a technology to outsmart us once it started thinking for itself.

### Stopping progress

Despite the inherent risks – to individual drivers or all of humanity – none of these researchers are calling for developers, engineers and other inventors to down tools. “I don’t think there are any challenges that are too hard for us to face, or reasons not to go down these paths,”

Reed College’s Bedau says. “I think we have to keep our eyes open and be flexible; I think those who would have us not go down these paths at all because of the possible risks are also forgoing the possible benefits.”

CSER’s Price says it isn’t about slowing innovation, but trying to improve our odds of survival. “We should be investing a little of our intellectual resources in shifting some probability from bad outcomes to good ones.”

Even if we wanted to, Bostrom doesn’t think it’s possible to halt technological progress. “Even if one thinks there are great dangers down the road, the obvious answer isn’t to try not to go there,” he says. “There’s great momentum behind a lot of this – it probably isn’t even an option on the table [to halt work]. We might slow things down by a few years, but we have to face these challenges anyway.”

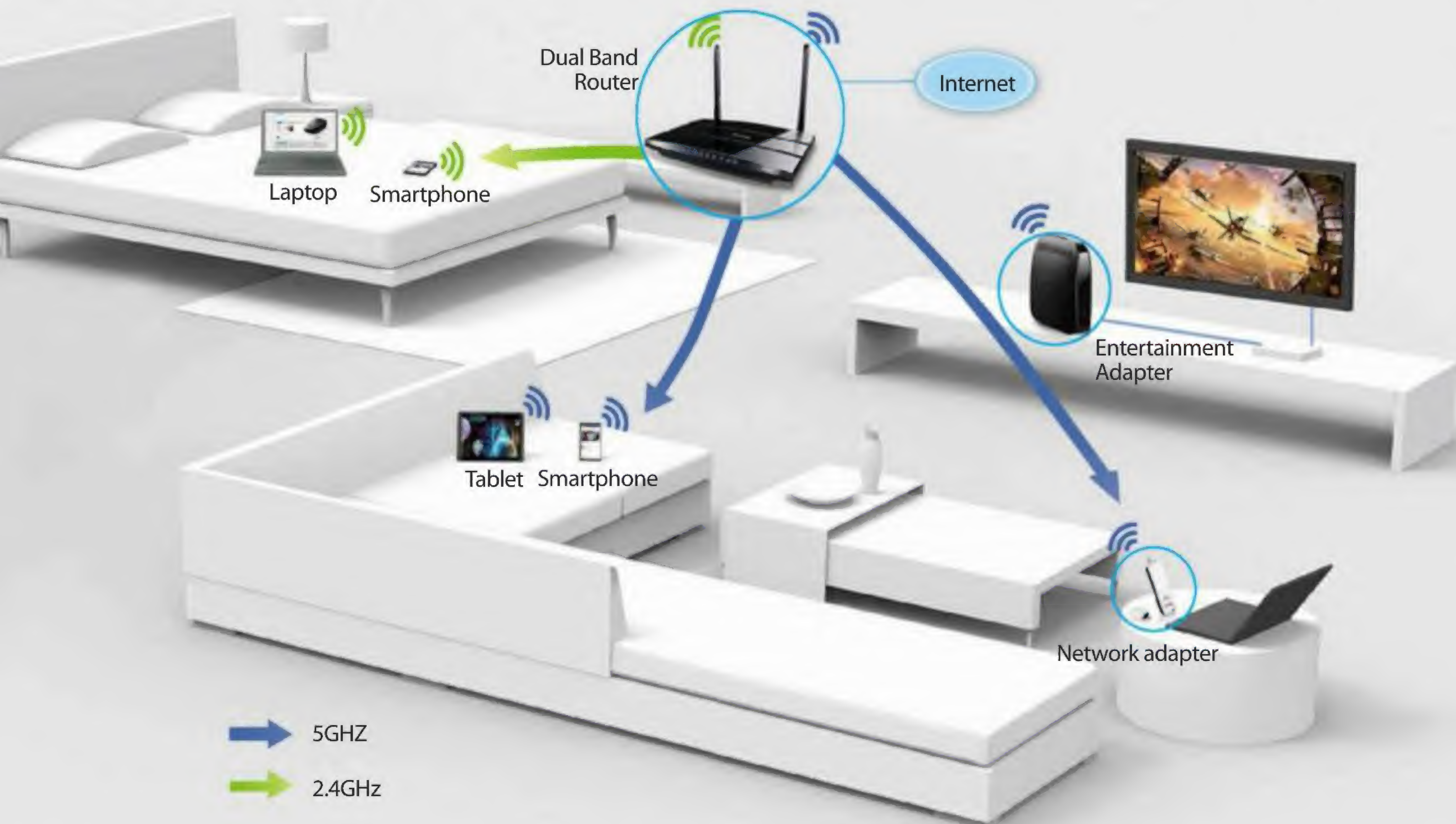


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# COURIER NIGHTMARES

**Barry Collins** reveals the remarkable problems *PC Pro* readers suffer at the hands of couriers – and how to mitigate against them

When I posted a blog on the *PC Pro* website in February, bemoaning the fact that a courier had decided the safest place to leave my new router was in the recycling bin, I pithily asked whether this was the “worst courier ever”. Judging by the flood of incredible courier nightmare stories that were subsequently posted on the comments section of the blog, the answer is “not even close”.

From tales of couriers hurling laptops over garden fences, to packages left to rot in the snow, to delivery drivers not even bothering to knock on the door before poking a “sorry we missed you card” through the letterbox, the *PC Pro* readership spewed forth with stories of disastrous deliveries.

Here, we share some of the worst examples of rank courier incompetence, and offer advice on your rights when couriers literally fail to deliver the goods.

## Sorry, you were in!

Several readers reported incidents of couriers dropping the “sorry we missed you” card through their letterbox, even though they’d waited in especially for a delivery to turn up.

“Twice I’ve caught the Royal Mail guy writing a ‘sorry you were not in’ letter. Twice I’ve called the complaints department. Guess what? I caught him twice more, after which he admitted that it takes too long to deliver to flats so he just writes cards and leaves them at the entrance.” **Nik**

“I was waiting for a courier to attempt re-delivery of a parcel. I’d somehow missed him the previous day, despite waiting in. The courier walked down the drive, shoved a ‘sorry we missed you’ note through the door, and ran back to his van. He must have pre-written the note, and didn’t even bother to carry my package with him. Fortunately, I managed to run after the van and banged on his window before he could get away. His excuse was that he didn’t see anyone through the window, assumed that nobody was home, and decided it wasn’t worth ringing the bell to make sure.” **SteveJ**





## Parcels left in crazy places

Like my binned router, it seems couriers think little of leaving packages in all manner of unsuitable spots.

"In the middle of winter, a parcel from relatives was left at my back door, in the snow. No note was left regarding this, and I found it two days later, when I actually used the back door and stepped on the package. Which, not surprisingly, was soaked through." **Matt**

"I know a crafter who sent an item via the Royal Mail. The postman left the item in the bin and it was emptied before the customer got home. The customer wants the item or a refund, but the Royal Mail won't pay up because it was delivered, leaving the crafter out of pocket." **James**

"I've had a similar experience, except rather than leaving it in the bin, they'd left it under my car." **N99123**

"City Link left an expensive router in my front garden – the courier didn't post a card through the door, so I realised only when I caught a glimpse of it a few days later. Fortunately, it hadn't rained, and the light-fingered ruffians on my street hadn't clocked it." **Russell G**

The law is hazy on what constitutes a completed delivery, but consumer watchdog *Which?* says that you have "good grounds to argue that the retailer should replace and re-deliver your goods" if they're left outside your home and go missing, or are damaged. However, you'll find yourself on a slightly sticky wicket if you've requested the package be left there.

As with all internet-shopping deliveries, your contract is with the retailer, not the courier firm. If you get no joy from the retailer, the Consumer Credit Act affords protection for items that cost in excess of £100, so pursue a refund via your credit card company if the item is suitably expensive. This obviously won't help you if the dustmen cart off the DVD the courier handily left in the wheelie bin, so take advantage of any delivery instruction boxes on retailer order forms to stipulate that the package shouldn't be left outside the home.

## Damaged goods

We hope the number of couriers retraining as midwives is close to zero, judging by the way they handle fragile packages.

"I once ordered about £1,000 worth of components from Ebuyer. The security camera outside caught Parcelforce 'delivering' it over my neighbour's 7ft fence and into their rock garden." **Andrew**

"I bought a printer some years back, from a certain Davey Winder. It was sent via Parcelforce, and arrived smashed to bits. He put in a claim for damages and Parcelforce said it would have to send someone round to examine the parcel before it could pay out. I was surprised to get an email from Davey a few days later asking why I hadn't kept the printer, as Parcelforce had told him they had come to my address to inspect the damage and been told that I didn't have it anymore. No-one from Parcelforce ever knocked at my door." **Joe**

"Back when a 21in CRT monitor was expensive, I caught a courier intentionally dropping my shiny new Sony Trinitron. Rather than putting it down carefully, he dropped it from chest height onto my doorstep. I was working in the garden, but I think I'd have heard the monitor stand breaking from inside the house." **SteveJ**

Couriers practising their rugby skills with your packages isn't that uncommon: a *Which?* survey found that 4% of respondents have had a parcel thrown over the fence. The Sale of Goods Act stipulates that the retailer is responsible for the goods up until the point they're delivered to the consumer.

You don't waive those rights, even if you sign to accept delivery of a package, although *Which?* suggests that you scribble "goods received but not inspected" on the delivery form, card or electronic device, if possible.

Inspect packages as soon as possible and report any damages to the retailer right away. Don't leave goods bought as birthday or Christmas presents unchecked for weeks or months, as that makes it easier for the retailer to successfully argue that you failed to reject the goods in sufficient time.

"Twice on the same delivery Yodel's website said they'd left a 'sorry you were out' card, but we'd been in all day and not received either card. I phoned to complain and the person at the depot gave us the GPS co-ordinates where the 'delivery attempt' had been logged. It turned out to be a lay-by on a main road five miles away from our house. If we asked for the parcel to be put out for delivery again, it was likely that we'd get the same result, so the only option was to collect the parcel from the depot, which is an hour's drive away in Cardiff. So, 'next-day delivery' took three days, a 120-mile round trip, three hours off work, and an awful lot of frustration and aggravation." **Simon Jones**

I live in Pool, Cornwall, but my parcel was delivered to Poole in Dorset, where they couldn't find my road. When I phoned up and chased where it was, I was advised I could collect it from the local depot in Poole. They didn't believe that there could be a Pool in Cornwall. The item was eventually returned as un-deliverable and I managed (with some argument) to cancel the order and order from elsewhere." **Michael**

It's possible to claim compensation – if you have to take extra time off work, for example – because a delivery didn't show up on the stated date. The website MoneySavingExpert has a template letter to fill in, claiming compensation for failed deliveries, at [www.pcpro.co.uk/links/225courier1](http://www.pcpro.co.uk/links/225courier1).

Proving you were in when they pushed the "sorry we missed you" card through the letterbox is much trickier. Security camera footage or witnesses that saw the delivery driver push the card through the box without ringing the bell will help any compensation claim; otherwise, it's your word against theirs.

When asked to comment on Yodel's missed delivery, company CEO Neil Lloyd said: "We take the timely delivery of the 150 million parcels we handle each year very seriously. Geotracking enables us to confirm the precise location of each parcel. If a failure is identified, we apologise and take the necessary measures to ensure that it is not repeated."



## Package is with a stranger

Courier firms assume we all live in Coronation Street, where everyone knows your name and will safely look after your parcel until you get home.

"I had a brand-new mobile phone sent by T-Mobile via Royal Mail. They left a 'you were out' card in the communal area of my block of flats. My neighbour got the card, went to the Royal Mail sorting office and got the parcel, although the name on the parcel and their proof of ID weren't the same. I had to threaten my neighbours with police and legal action until someone left it in front of my door." **Yiannis**

"I had an Amazon Prime package 'delivered' by DPD last week. Had a confirmation text the night before and selected 'deliver to neighbour' since I knew I'd be out and someone would likely be around. Returned home the following evening to find a large Amazon box stood on the doorstep, with no attempt made to hide or obscure it at all. I checked the online tracking and found it had been signed for by 'A Driver'." **Neil Harper**

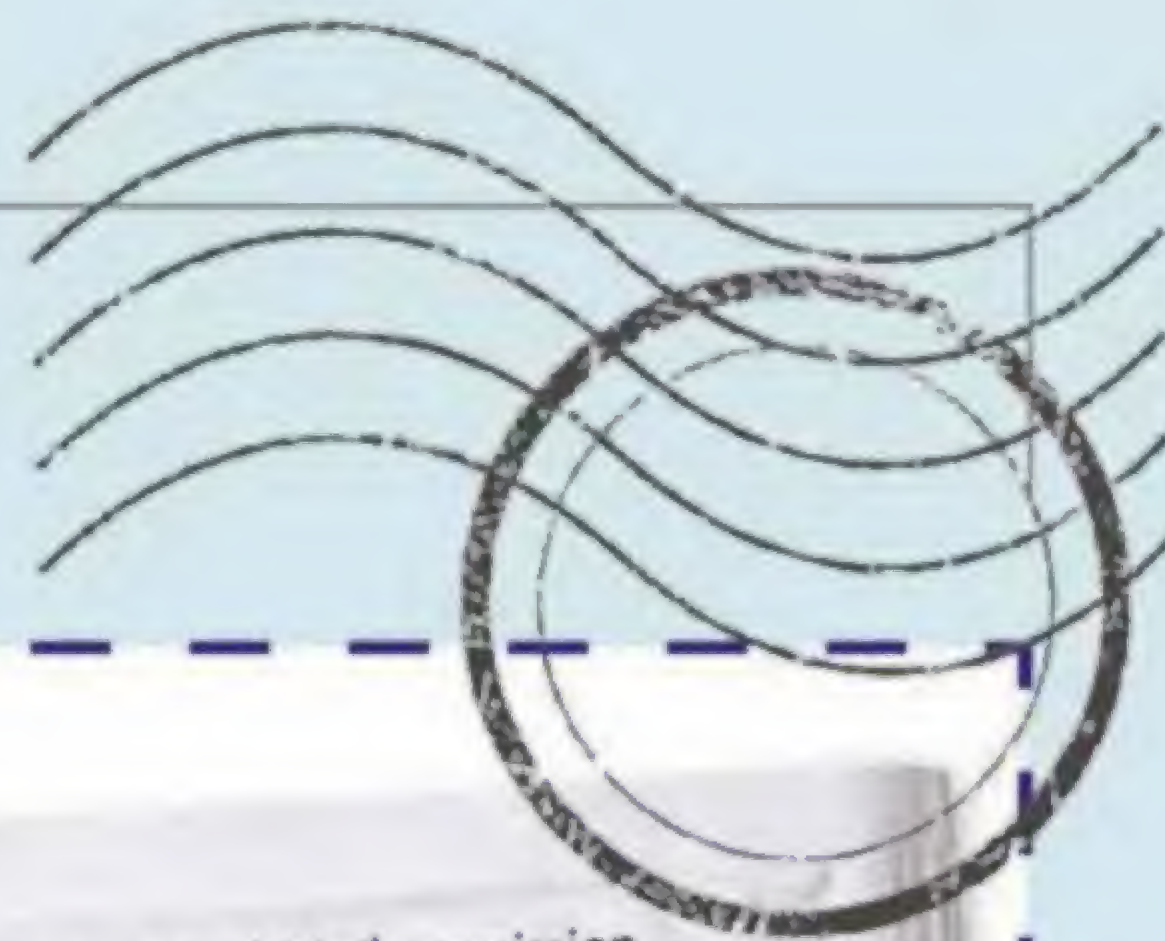
"Some personalised mugs and calendars I ordered for Christmas were left – opened – under the communal stairs of a block of flats half a mile from my house." **Ryan Thomas**

"I've had the Post Office leave both a Kindle (complete with big blue words such as 'Amazon Kindle' emblazoned on the box) and an iPod on the doorstep. We've also had some DVDs left in this way. Not that we found them on our doorstep, but when a neighbour found the ripped-open package on a nearby field. Fortunately, the little thugs who'd stolen them didn't share our taste in films." **Dave Faulkner**

Last October, Ofcom granted the Royal Mail permission to leave packages with a neighbour if the recipient wasn't in, allowing it to adopt a practice that was already widespread across the rest of the courier industry. If you don't wish your packages to be left with a neighbour, the Royal Mail insists you place a sticker on or near your letterbox, which can be ordered from [www.pcpro.co.uk/links/225courier2](http://www.pcpro.co.uk/links/225courier2). Unfortunately, you can't stipulate which neighbour packages should be left with, and the postman is given the discretion to decide what constitutes a "neighbour" – it isn't restricted to the people immediately next door.

What happens if your neighbour damages the package, or decides to feign ignorance and keep it for themselves? "If any items are delivered to a neighbour and are subsequently lost or damaged, consumers will still be able to make a compensation claim in the normal way," the Royal Mail states. "All claims will be investigated and assessed under the normal processes and in line with the terms and conditions of the service used."

Which? argues that the retailer is technically in breach of contract should any package come to harm or go missing after being left with a neighbour, since it wasn't delivered to the stated address – unless you specifically agreed to allow the courier firm to drop the package at a nearby address. Check your delivery Ts&Cs carefully.



## A ROYAL MAIL INSIDER ON "SORRY WE MISSED YOU" CARDS

At Royal Mail, the "sorry we missed you" cards are known internally as P739 cards. It's fair to say that complaints surrounding these P739s make up the biggest proportion of complaints that the company receives every year. This is only increasing as the postman's pouch changes towards a progressively parcel-heavy ratio. More parcels equals more times that customers will not be in, and a P739 has to be left.

There has been incredible focus by the company on making sure that the process is followed properly. This involves knocking on the door of the customer, waiting and then knocking again before the P739 is posted. It's common to knock first, then start writing out the card while waiting for the door to be answered, and then only post it once the second knock has happened and nobody has come to the door.

As you can imagine, there are plenty of ways to cut corners if the postman were so inclined. Parcels could be left at the delivery office and cards pre-written

with no attempt at delivery being made; items that need signing for could be signed by the postman and then posted. These are big no-nos and are sackable offences, coming under fraudulent behaviour and bringing the company into disrepute.

The company has never issued a directive to do any of the practices mentioned in this feature. It would be a disaster if they did – we all work in a unionised environment and there would be leaks to the press within hours of such a directive. Not to mention the postal regulator getting rather annoyed and deciding to fine up to 10% of turnover.

The absolute best way to put an end to this practice is to complain to customer services – complaints are followed up, although the customer doesn't get to know this.

Our Royal Mail insider's identity has been withheld.

**Something for you**

Time: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name: \_\_\_\_\_  
 Address: PRK IN BLUE BIN  
 Postcode: \_\_\_\_\_

Your item:

<input type="checkbox"/> Special Delivery™	<input type="checkbox"/> Letter	Number of items: _____
<input type="checkbox"/> Royal Mail Tracked™	<input type="checkbox"/> Packet	
<input type="checkbox"/> Recorded Signed For™	<input type="checkbox"/> Perishable item	
<input type="checkbox"/> International item		

could not be delivered because:

☐ a signature is required ☐ it's too large ☐ unable to gain access

Your item is:

☐ waiting for you at your local Delivery Office (see reverse of card)

☐ in your official Safeplace (for Royal Mail Tracked™ items only)

☐ with your neighbour at \_\_\_\_\_

☐ please note this was an attempt to redeliver as requested

Item number(s): \_\_\_\_\_

Delivery officer's initials and duty number: \_\_\_\_\_



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# HOTEL TECH

## *A room with a futuristic view*

**Davey Winder** reveals how technology is revitalising the hotel industry, from check-in to room service and beyond

**W**alking into the hotel lobby, you skip the queue at the check-in desk and head straight to the lifts. You already know your room number – and have the key – since you were sent a text message containing the room details and a link to a barcode to unlock the door. Once you're inside, the in-room iPad lets you adjust the temperature, play your own music, order room service, book a spa session, and pick a film to watch on the 3D television.

Monitored by analytics tracking cameras, the hotel's restaurant seems to open and close

at just the right times, and there's always staff on hand for any requests that can't be delivered digitally. Checking out is as simple as tapping a button on your smartphone app, and, of course, there's no key to return.

Not only does this hi-tech hotel of the future already exist, but it has the potential to save money, too. Here, we take a look at the technology being used by hotels to make your stay more secure, convenient and fun, while at the same time driving down costs for the owners. From smartphone-generated door keys via virtual concierge services and tablet check-in

systems, to IP security cameras and iPhone payment devices – as far as the hotel industry is concerned, the future is now.

### CHECKING IN

Physically checking in when flying is fast becoming outdated; most travellers use an online check-in system to avoid queues at the airport and select their own seat. Similarly, the pick-up process for car rentals has also been automated. With hotels having followed airlines and rental firms into the realm of online





booking many years ago, it's surprising the industry has taken so long to catch up with automated check-ins. Thanks to smartphones, however, it finally has.

One example of automated check-in technology is NCR's Express Key system, which allows guests to pick up their room keys by swiping the booking confirmation barcode from their email on a smartphone (or a printed copy) at a kiosk. As well as barcodes, the NCR system also accepts a wave of a near-field communication (NFC)-enabled handset, or even an acoustic key tone. The kiosk is small enough that it can be located on table tops or in lift lobbies, meaning guests can retrieve lost keys, or replace ones that don't work, without having to drag their luggage to the lobby or wait in the queue at the front desk.

#### **DIGITAL ROOM KEYS**

Radio-frequency identification (RFID) and NFC systems also do away with the need to collect a physical key; instead, a smartphone can be used to unlock the door.

Guests at the Clarion Hotel in Stockholm have been doing just this as part of a pilot scheme conducted by HID Global. Before

arriving at the hotel, they receive a text message with a link to online check-in, and an electronic room key is sent to their phones. Guests skip check-in and go straight to their rooms, opening the door by holding their phone in front of the lock. When they check out, they simply touch their phones against a kiosk in the lobby.

"NFC digital keys essentially replicate the existing card-based access-control principles and model via an embedded credential in a handset," says Harm Radstaak, managing director for the EMEA region at HID Global. In order to secure the transactions, the smartphone requires an applet to hold the digital keys, an app for the user to interact with, and the digital keys assigned to the individual phone, which is read by the door's reader hardware.

"They provide a safer and more convenient way to provision, monitor and modify credential security parameters, temporarily issue credentials as needed, and cancel credentials when they're lost or stolen. In doing so, the system maintains the hotel's security without

#### **Hi-tech tools can boost hotel revenue and increase customer satisfaction**

impacting on the convenience of guests," Radstaak says. "Another benefit of this system is that NFC-enabled physical access control makes it easier to track who's entering and exiting the hotel." In the Clarion trial, the hotel cut costs since it didn't have to buy plastic key

*"NFC keys replicate the card-based access principles via an embedded credential in the handset"*

cards, and also freed up check-in staff for other areas of the hotel.

#### **THE VIRTUAL CONCIERGE**

Self-service kiosks have been a fact of life in top-end business hotels for a number of years, with the likes of NCR supplying modular check-in booths, express key pickup points and digital signage to automate everything from



finding the best route from your room to your meeting or the gym, through to accessing replacement door keys.

But the real advances in virtual concierge services are being driven by iPads. One of the best examples of this can be found at The May Fair Hotel in London, where each of the 18 signature suites has an in-room iPad with a concierge app.

VirtualHotel, from app developer Cardola, provides guests with instant access to services inside and outside the hotel, such as restaurant reservations, room-service menus and ordering, spa bookings, wake-up calls, airport check-in services, weather reports, and guides to the local area. The software also lets the hotel improve service by sending personalised audio, text or video messages or promotions to guests' iPads and iPhones. Those not staying in one of the signature suites can download the app onto their own iPad or iPhone (Android handsets will have been added by the time you read this). Evidently, the iPad-based VirtualHotel system is making it easier for The May Fair guests to access room service and book spa trips, since there's been a significant increase in sales in the two months since the hotel installed the technology, according to general manager Anthony Lee.

Lee said the iPad-based tool is "a vital ingredient in the future success of [the] hotel," as travellers now expect hotels to deliver top-notch tech as part of the experience. For example, Bring Your Own Device (BYOD) is now commonplace, not only for business users, but also for leisure travellers.

Hoteliers have to get onboard with the trend, and exploit smartphones and tablets



● The NFC digital door key enables your smartphone to lock and unlock your hotel room

as part of the hotel experience to create a more inviting environment – which not only increases customer satisfaction levels, but also boosts hotel revenue.

The apps are designed to provide seamless service to guests 24 hours a day, said Tim Butterworth, managing director at app developer Cardola. "The technology doesn't

replace the traditional concierge service, but instead complements it. It provides guests with more control, while also reducing the amount of time staff spend answering phones and taking orders."

## SECURITY

Think hotel security and you probably conjure up images of door keys and room safes. While hoteliers *are* moving to next-generation keys, room safes remain firmly in the lo-tech arena.

Security is slowly moving on, however, especially when it comes to CCTV. Old-fashioned analogue systems still dominate the industry, but the technology is starting to shift towards hi-tech IP CCTV systems. "One of the main benefits is the image quality an IP-based system has over analogue CCTV systems," says Atul Rajput, regional director for Northern Europe at Axis Communications, which is bringing an IP-based system to hotels such as the La Suite West in London. "IP systems offer crystal-clear images that are a minimum of three times the definition of the analogue cameras that exist in many hotels today."

This significantly increases the chances of positively identifying individuals when reviewing an incident or analysing internal theft or fraud; gone are the days of grainy *Crimewatch* images.

IP cameras offer other benefits, too, in the form of discretion. Premium hotel brands are placing an emphasis on the need for smaller camera; size is becoming a more important factor in the evaluation and selection process.



● The VirtualHotel app from Cardola turns an iOS device into a virtual concierge



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IP cameras can also be controlled, and footage reviewed, via any internet-enabled device, notes Rajput, “which is especially important to large hotel chains and hotel managers who are constantly on the move.”

In addition, IP cameras can help hotels make decisions on what services to keep open, hopefully ending the days of wandering the halls looking for an open bar. “IP cameras with embedded people-counting analytics allow hoteliers to measure hourly traffic levels and evaluate performance across a chain of hotels, which is particularly relevant to hotels that offer public access to their bars, restaurants, shops and fitness centres,” Rajput says.

## WHAT NEXT FOR HOTEL TECH?

Apps are set to take over hotels, “growing exponentially” across the hotel industry, says Cardola’s Butterworth. While they’re currently used for booking and check-in, and are increasingly used to make staying at a hotel more convenient, their remit will soon extend to the whole experience. “In time, I think there will be an app for every hotel, and that app will vary from something that is only providing information before a guest arrives, to one that allows remote check-in and check-out, or even an app that provides users with entry to their hotel room, removing the need for a key.

“The challenge for hotels will be moving from the typical five-minute use of an app – usually to book a room – to maintaining brand identity and differentiation while simultaneously increasing take-up from guests.”

The future isn’t only apps, however – there’s plenty of hardware involved, too. It’s on show at the most tech-savvy hotel in London, Eccleston Square Hotel in Victoria, which has won LateRooms.com’s Best Gadgets award for two years running.

Showcasing the future of hotel tech, Eccleston Square provides guests with an in-room iPad for browsing the web over high-speed Wi-Fi, ordering room service, or booking a personal trainer at the hotel’s gym. The rooms also feature Hästens’ electronically adjustable massage bed, and the bathrooms boast “smart glass” walls, which are transparent to provide a feeling of space, but turn opaque at the flick of a switch when privacy is required. In the future, visitors will be able to control the room’s lighting, temperature, curtains and music via an iPad, the hotel says.

There are other conveniences at Eccleston Square for tech-savvy travellers. The rooms feature iPhone docking stations, a personal safe large enough for a laptop, and power outlets for US, European and UK plugs, so you don’t need to fiddle with converters.

There are also built-in USB chargers, and an HDMI input so you can watch your own



Discrete but powerful IP-based CCTV systems are proving a hit with hotels making the move from analogue technology

content on the TV – the huge, 46in 3D TV, that is. There’s a TV concealed within the bathroom’s steam-proof mirrors, and the 103in 3D “Media Wall” in the hotel lounge. What’s more, there are VoIP phones for making free London calls, and an electronic “do not disturb” sign you can switch on from bed, saving you the hassle of getting up to hang a plastic sign over the doorknob. Any innovation that keeps us in a massage-giving bed longer is tech we want to see.

## THE CHERRY ON THE CAKE

Bed-and-breakfast owners are also turning to tech to solve customer frustrations and cut costs. Small businesses such as B&Bs often find it impractical to install a credit card payment terminal, as the long-term contracts and associated fees introduce too much financial risk, yet they stand to lose business by not offering their customers the option of paying by credit card.

This was the problem facing Michael Pitchford, the owner of the Cherry Holme Bed and Breakfast in Cumbria. His answer was to turn his iPhone into a secure card payment terminal using Swedish service iZettle. By using the iZettle app in tandem with dedicated credit card reader hardware, Pitchford can now



iZettle brings affordable credit card payments to the B&B sector via an iPhone app and a plug-in card reader

take secure card payments via his iPhone and iPad. “Using iZettle has really helped us as a business,” says Pitchford. “The customers have been delighted with it, and many of them have commented on what a great idea it is.”

iZettle also enables users to email receipts to customers instantaneously, reducing paperwork. “Many customers, especially business ones, prefer emailed receipts,” Pitchford says. “That way, they don’t have to look after a small piece of paper and risk losing it before claiming expenses.

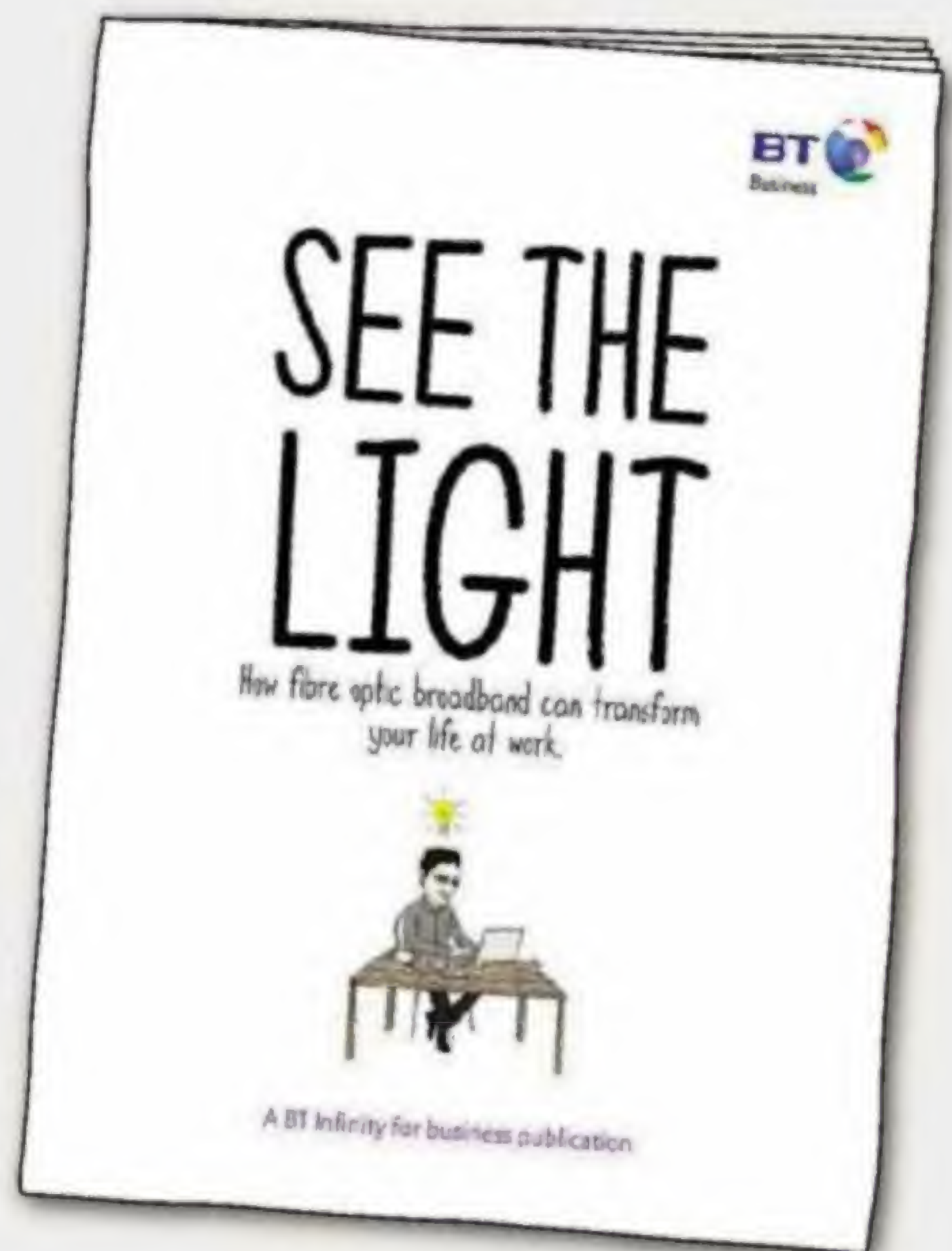
“iZettle also allows us to add a photo of our bed and breakfast to the receipt, giving it a more personal touch.”

There are no monthly fees or contracts; users pay a 2.75% fee to process each payment. No sensitive data is stored on the mobile device, and all data traffic is encrypted. iZettle is regulated by the Swedish Financial Supervisory Authority.



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# IN DEPTH

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## Understanding power consumption

Wondering what size power supply to buy, and how to make sense of power requirements? **Darien Graham-Smith** explains all

**E**lectronics manufacturers are continually seeking to reduce the power consumption of the components and products they manufacture. “Performance per watt” is a key measurement for new processors. You might wonder why this particular aspect of component design attracts so much attention – after all, laptops and tablets are already tremendously energy-efficient. Yet device and component manufacturers invest millions in shaving every watt they can from their power draw, and on these pages we’ll explain why. We’ll start by looking at what exactly power consumption represents.

### Volts and amps

If you remember your physics from school, you’ll know that electricity is measured in volts and amps. It can be a little difficult to get your head around what these measurements really represent, but for everyday purposes you can think of voltage as representing the “pressure” at which the electricity flows out of the power supply, and of amperage as measuring how charged up with energy that flow is. Multiplying the voltage by the amperage gives us the total power received by the device, which is measured in watts.

It should be clear that voltage and amperage represent quite different properties of

electricity. Voltage is “pushed out” by the power supply at a fixed level: if your power supply is rated at more volts than your device can handle, it will cause the device to overheat (and possibly even explode). Amperage, conversely, is “pulled in” by the device as needed. A power supply that’s rated at 2A can provide up to two amps of charge, but you can safely use it to power a less power-hungry device.

How do you find out the voltage and amperage ratings of a power supply? Simply turn it upside down. Almost all power supplies bear a sticker showing voltage and amperage ratings (although you may need to pore over some very small print to find the relevant figures). Many electronic devices also have stickers showing the input voltage and amperage they expect.

With this information, it’s easy to work out if a given power supply will work with a laptop or other device: you simply need to check that the voltage ratings of the two are equal, and the amperage rating of the power supply is equal to or greater than that of the device. When it comes to devices that charge via USB, the voltage is always 5V, so you can safely plug a phone or tablet into any USB port. However, the ports found on laptops and PCs provide comparatively low levels of current (0.5A for a USB 2 port and 0.9A for USB 3): if your tablet charges slowly, or not at all, you’ll need to use a more powerful USB charger that plugs directly into the mains. These are typically rated as 2A, and can go as high as 5A.

### Desktop power supplies

What about desktop PC power supplies that are rated in watts, rather than volts and amps? This is a special case, as a single ATX power supply



● A simple equation can inform you which power supply you need



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- Power consumption .....p50
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- Can I delete it?.....p58

actually provides several different power outputs – known as “rails” – running at a variety of voltages (namely 3.3V, 5V and 12V) to suit the different components within the desktop system. The quoted wattage represents the maximum total power that can be provided across all of these rails simultaneously. If you check the technical documentation for a desktop power supply, you should find an amperage rating for each rail, showing how the available power is divided up.

In practice, the various motherboard components, drives and expansion cards that sit on the lower voltage rails generally have very modest power demands. The only connections whose ratings you might need to worry about are the 4- or 8-pin 12V CPU power connectors and – if you have a high-end graphics card – the 12V 6- or 8-pin PCI Express power connectors. Again, check the technical documentation to find out how much power your graphics card requires. This may be stated in watts rather than amps, but that’s no problem. Since wattage is voltage multiplied by amperage, we can calculate the required amperage via a simple division. For example: cards based on Nvidia’s GeForce GTX 680 design have a quoted maximum power draw of 195W, so the relevant 12V rail must be rated at 16.25A or higher.

### What’s so great about watts?

Since wattage can be simply derived from voltage and amperage, you might wonder why we need to bother with it. The answer is that, precisely because it combines those two measures, it gives us a single, simple unit for talking about power consumption. It doesn’t tell us everything about an electrical current: a power draw of 50W might represent a flow of 10A at 5V, or it could be 2A at 25V. But for many practical purposes that doesn’t matter. Each configuration will drain a battery at precisely the same speed, and will add the same amount to your electricity bill. A device drawing 100W will consume twice as much energy in a given period of time, or will drain a given battery twice as quickly – again, regardless of the actual voltage and amperage.

There’s still one complicating factor to consider: wattage isn’t necessarily stable over time. It may be constant for very simple appliances such as electric heaters and vacuum cleaners, but computers and smartphones have far more erratic power demands. Their

## Understanding battery capacities

The charge capacity of a mobile battery is typically expressed in watt-hours (Wh). A battery rated at 48Wh will provide one hour of use at 48W, two hours of use at 24W and so forth. Some manufacturers express battery capacity in terms of milliamp-hours. As we’ve seen, it’s easy to convert this into watt-hours if you know the voltage of the battery: for most modern laptops, that’s 11.1V, so a battery rated at 4,400mAh is normally equivalent to one rated at 48Wh.

Focusing on battery capacities isn’t always helpful, however. No two mobile devices – be they laptops, tablets or



smartphones – use identical components, and OS and application setups vary, too. Two devices using identical batteries might thus perform quite differently. However, understanding watt-hour ratings can give you a sense of what to expect, and provides a useful comparison point if you’re considering upgrading to a high-capacity battery.

amperages – and hence their wattages – go up and down depending on what you’re doing. Sitting at the Windows desktop doing nothing, a modern desktop PC might draw something of the order of 60W. Load up a demanding game that taxes a 3D graphics card, and simultaneously floods the CPU with logic and physics calculation, and your energy demands could easily double or triple.

This is why, when we review desktop PCs, we state both “idle” and “peak” power ratings. Similarly, it’s why our laptop reviews report battery life in both light and heavy use. A battery powerful enough for only two hours of heavy multitasking can often support six or seven hours of casual web browsing.

### Saving power

This brings us to the crux of the issue. Power consumption is a key issue in consumer electronics, not simply because saving power is good for the environment, nor because it reduces your electricity bills. Those are certainly valid considerations, especially for businesses deploying hundreds or thousands of computers, but for an individual, electronic gadgets are already very cheap to run (*see Putting a price*

*on power*, p52). More than this, though, reducing power consumption enables laptops, tablets and phones to run for longer on a single charge – a very desirable thing indeed.

There are many ways to minimise the power consumption of a device. Some of these are visible to the user: most mobile devices, for example, switch their screens off when they haven’t been used for a while. Laptops have a “sleep” mode that draws only a trickle of

**“Reducing power consumption enables devices to run for longer on a single charge”**

power, so as to keep the hardware in a state from which it can quickly reawaken. If you’ve delved into Windows’ advanced power settings, you’ll be familiar with other power-management features, such as spinning down mechanical hard disks that haven’t been used for a certain period of time.

Many power-saving measures, however, take place behind the scenes. The continual shrinking of CPU dies is a case in point. Intel’s latest Ivy Bridge processors perform very similarly to older Sandy Bridge models, but because they’re manufactured on a 22nm process rather than a 32nm one – meaning that



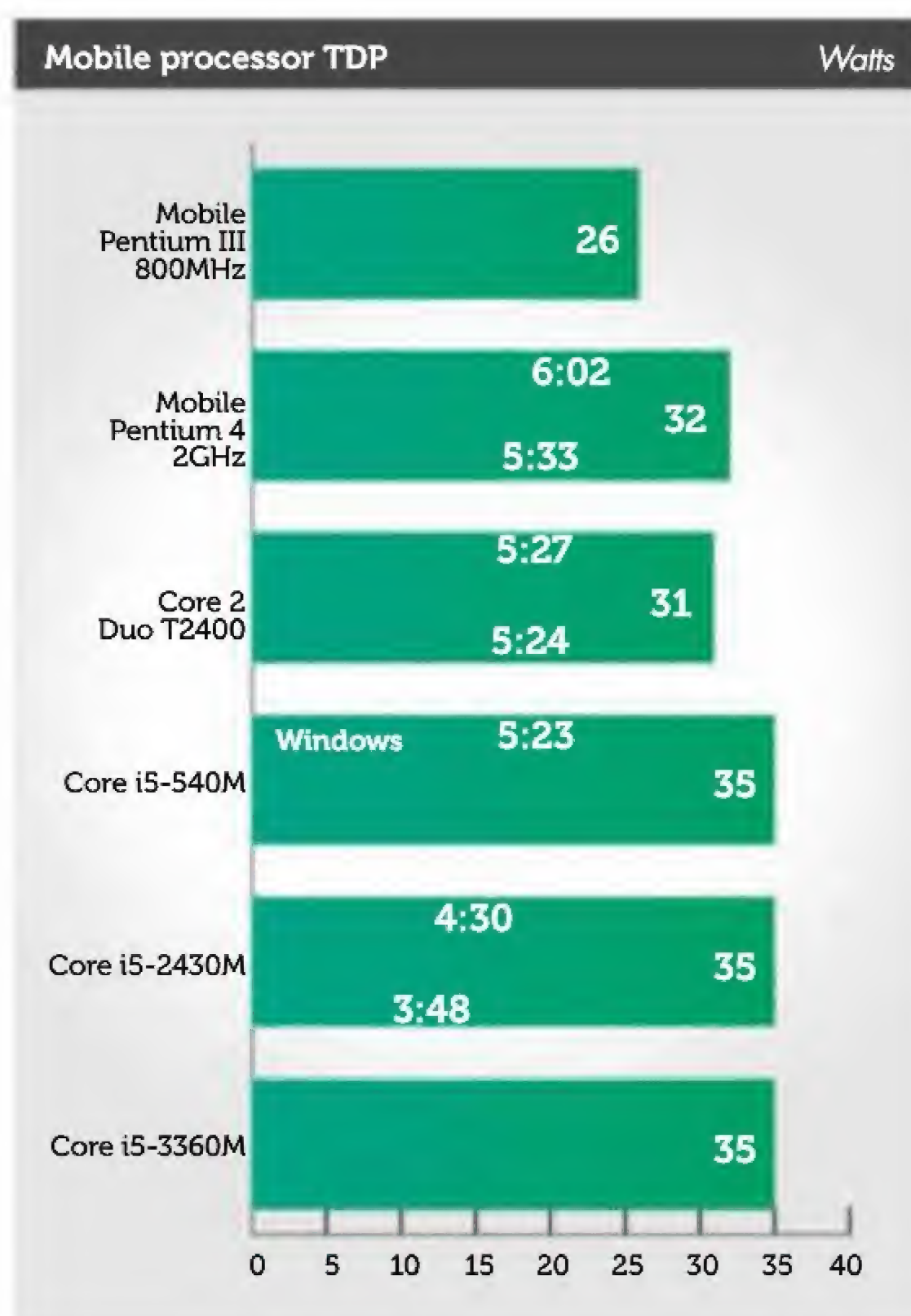
the smallest components inside the chip are around 30% smaller – they can run at lower voltages. In practice, tasked with the same workload, Ivy Bridge can shave more than 10% off Sandy Bridge's power consumption. Smaller dies tend to run cooler, too, meaning less energy is needed for fans (although in the specific case of Ivy Bridge, the thermal advantage is offset by Intel's use of cheaper heat-dissipation materials in its newer chips).

Processors have also become progressively smarter about managing their own power consumption. The Intel SpeedStep system, introduced with the Pentium III, automatically reduced the operating frequency of the entire CPU – and hence its energy requirements – whenever full power wasn't required. In more recent architectures, the concept has grown into Turbo Boost, which dynamically clocks individual CPU cores up and down as needed.

Modern CPUs also save energy by selectively shutting down internal features that aren't being used, and only waking them up as needed (a process called power gating). You can browse the web and use desktop applications without wasting power on idle processing cores and unneeded GPU components. Intel's forthcoming Haswell architecture extends this concept by moving peripheral and disk controllers into the CPU package, so they too can be gated – a move that, it's rumoured, may slash a PC's overall power consumption by up to 50%.

## Understanding TDP

With all this work going into reducing CPU power consumption, you may be surprised to see that quoted power requirements have actually crept upwards over the years. The graph below (see *Mobile processor TDP*) shows Intel's published power ratings for a



## Putting a price on power

The amount you pay for electricity varies according to all sorts of factors: different power company deals, different areas and different times of day all come into play. Generally speaking, though, electricity in the UK costs around 15p per kilowatt-hour. Knowing this, we can put a rough price on how much it costs to charge a typical mobile device. Note that battery charging isn't a perfectly efficient process: to account for this, we've assumed that it takes 125% of a battery's energy capacity to completely charge it.

You can use a similar calculation to estimate the price of running your PC – but you'll need to calculate its average power draw, and how long it spends switched on over the course of a year, which can be quite hard to pin down. If you can come up with an estimate, though, you can translate it into an approximate annual cost, using the formula (average wattage ÷ 1,000) × hours per year × 0.15. You may want to add a fudge factor of 25% or so to account for electrical inefficiencies – and don't forget to add in the power consumed by your monitor.

Device	Battery capacity	Recharge cycle	Total cost per year
Amazon Kindle	5.6Wh	30 days	£0.01
Nexus 7	16Wh	3 days	£0.37
Apple iPhone 5	5.45Wh	Every day	£0.37
Samsung Galaxy S III	8Wh	Every day	£0.55
Apple iPad with Retina display	42.5Wh	3 days	£0.97
Lenovo IdeaPad Yoga 13	54Wh	Every day	£3.70
Apple MacBook Pro 13in with Retina display	74Wh	Every day	£5.06

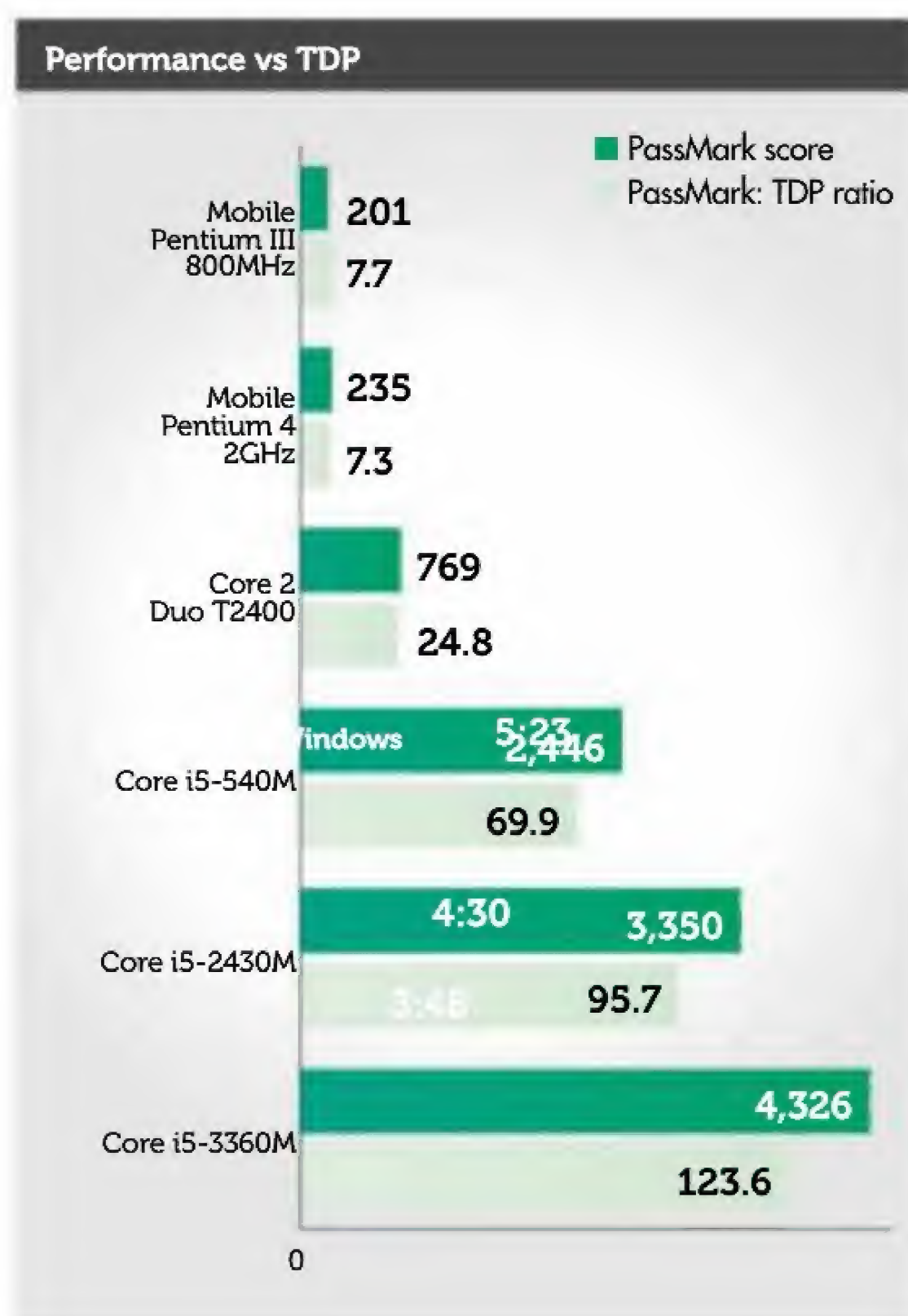
historical selection of mainstream mobile CPUs. The figures seem to indicate that modern processors' power requirements are around a third higher than those of the venerable mobile Pentium III.

Happily, things aren't anything like as bad as they look. Intel's figures represent the "thermal design power" (TDP) of the chip – which is defined rather loosely as the "near maximum power a product can draw for a thermally significant period while running


commercially available software". For practical purposes, you can think of it as the theoretical maximum power a CPU will draw when all its parts are enabled and running at full speed.

Comparing TDP across different generations of processor is therefore very misleading. The processing power of a Core i5-3360M running flat out is around 20 times greater than that of a Mobile Pentium III – it's actually a miracle that power consumption has gone up by so little. More to the point, this maximum wattage is rarely reached. A modern Ivy Bridge processor is likely to spend the vast majority of its time in a heavily gated and speed-limited state, drawing a fraction of the wattage of the Pentium III – and still delivering better performance. The second graph (see *Performance vs TDP*) shows how the mobile processors stack up in terms of performance per TDP watt, based on performance figures from the PC PassMark benchmark.

It should be clear that, in many cases, TDP is a red herring. Although a low TDP often correlates with lower power consumption – see, for example, Intel's ultra-low-power 17W Ultrabook processors – it isn't a reliable guide to real-world power consumption, and hence not a reliable indicator of battery life. The only time you need to consider TDP directly is if you're assembling your own PC: in this case, you'll need to be sure your power supply provides enough amps on the 12V CPU rail to accommodate your processor's TDP. Otherwise you may find the system becomes unstable when you push it hard.







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## HANDS ON

# Manage a mailing list with MailChimp

An email list is a fast and cost-effective way to distribute information.

**Dave Stevenson** shows you how to get started



**E**mail marketing gets a bad rap. With so much spam already clogging up inboxes worldwide, small-business owners may be understandably wary of sending automated sales emails. But a well-run email campaign can yield positive results. Carefully targeted, well-designed emails to an opt-in audience can increase web traffic and conversions more effectively than the most active social media campaign.

Making a success of email marketing is easier said than done, however. Building a list, managing sign-ups, designing your emails and distributing them is a big job, and it gets bigger as your business expands. Enter MailChimp – a service that provides list management, drag-and-drop email design and in-depth performance reports for organisations of all sizes. And there's no need to pay until your list grows to a substantial size, so with the aid of a free HTML editor, it's possible to launch your first email campaign without paying a penny.

## Signing people up

The first way MailChimp helps out is by storing the addresses of everyone who has agreed to hear from you in a mailing list. If you already have a list of email addresses, you'll be prompted to import it right after creating your MailChimp account (*see Importing an existing mailing list, opposite*).

If you don't have such a list, or want to expand one, MailChimp can also host a handy sign-up page for you. Under MailChimp's Lists tab, you can choose "Create forms" to set up sign-up pages where your would-be mail recipients can enter their names and addresses. To prevent the service from being abused, MailChimp uses a double opt-in process; when a new email address is entered into your web form, the system doesn't add it to your list until

the owner of that address acknowledges receipt of a confirmation email. This reduces spamming, by making it impossible to sign up people without their knowledge and active assent – MailChimp estimates that a list using double opt-in receives only around three spam reports per 50,000 recipients.

However, it gives new users a little extra work to do before they start receiving your messages. Hosting sign-ups at MailChimp's site also limits the ability to use your own website branding, and to integrate the sign-up process into other parts of your business.

Happily, there are ways to mitigate both of these concerns, should you wish to do so. Head to the "For your website" dropdown box in the main List view and you'll find the code for the sign-up form, which you can copy and paste into a page on your own site. The classic form comprises standard HTML, CSS and JavaScript, so customising it is simple.

Email authentication can't be disabled within MailChimp, but you're free to use a different sign-up system that doesn't insist on double opt-in if you prefer. One such alternative is the excellent Web Form Builder from CoffeeCup ([www.coffeecup.com](http://www.coffeecup.com)) – a standalone service that provides you with a wysiwyg interface for building web forms, and supports the MailChimp API, so all you need to do is generate an API key and plug it into CoffeeCup's software to have sign-ups automatically added to your mailing list. The basic version of Web Form Builder is free, but

**"A useful feature of MailChimp is the ability to divide your mailing list into groups"**

if you want to host the forms it creates on your own site, you must upgrade to one of CoffeeCup's premium accounts, which start at \$5 (around £3) per month.

Another useful feature of MailChimp is the ability to divide your mailing list into groups: for example, you might have one list



## »» Importing an existing mailing list

You can add users without MailChimp's automatic sign-up form – but make sure you have permission first.

It's easy to manually add email addresses directly to a list. This capability is useful if, for example, you've been collecting email addresses via physical sign-up sheets, or if you've previously been using a different system to manage your email subscriptions and want to switch to MailChimp without requiring everybody to sign up again. MailChimp allows you to import mailing lists as CSV files or paste them in from a spreadsheet program. You can also manually type in addresses one by one.

Be careful not to sign up recipients who aren't expecting to hear from you, however. Using email addresses you've acquired from third parties, whether bought, rented or simply found, is a strict no-no. The same goes for simply dumping your Outlook contacts

database into a mailing list – you'll inevitably end up adding users who don't want to receive emails from you. This will attract spam reports, and MailChimp takes spam very seriously – with 1.2 million users sending more than 95 million emails a day, it can hardly afford to be blacklisted by ISPs or spam-detection services. So if you receive more than a few spam reports per month, you can expect the company to take action.

The golden rule for avoiding suspicion of spamming is to explicitly tell new sign-ups that you'll be using their email addresses to get in touch with them. If consent isn't given, or is only implied, expect MailChimp to take tough action if you receive too many complaints. If the number of abuse reports hits one in 1,000, you'll receive a warning; go far beyond that and you'll be suspended until you can prove your mailing recipients definitely asked to hear from you.

of people who want to receive all your emails, another list that wants to see emails from you only once a month, and a third that only wants to hear about special promotions. You can manage your groups by clicking Groups on the list-management page. You can also allow people to choose which group they join when they sign up, via radio and tickboxes, or a dropdown menu for people to classify themselves. When you create email campaigns, you can then filter the recipients by group.

## Creating your first email

The emails you send from MailChimp to your mailing list are known as campaigns. The first step in creating a campaign is deciding how you want your emails to look. The simplest approach is to use one of MailChimp's bundled templates. These are all but guaranteed to work in a wide range of email clients, and they're highly editable, so you can add your own company artwork and brand colours to make them less generic.

If you can't find anything suitable among the templates on offer, it's possible to use bespoke templates. You can use an HTML editor to put together the kind of box-based design MailChimp expects, complete with editable content areas for images and text, which can then be imported or pasted into MailChimp. The process is similar to creating a web page, but with caveats: for one, mail clients aren't guaranteed to render CSS layout information correctly, so old-fashioned nested tables are a safer way to specify your email's layout. Second, although you can use CSS for styling text, your message must be self-contained, so you'll need to use inline

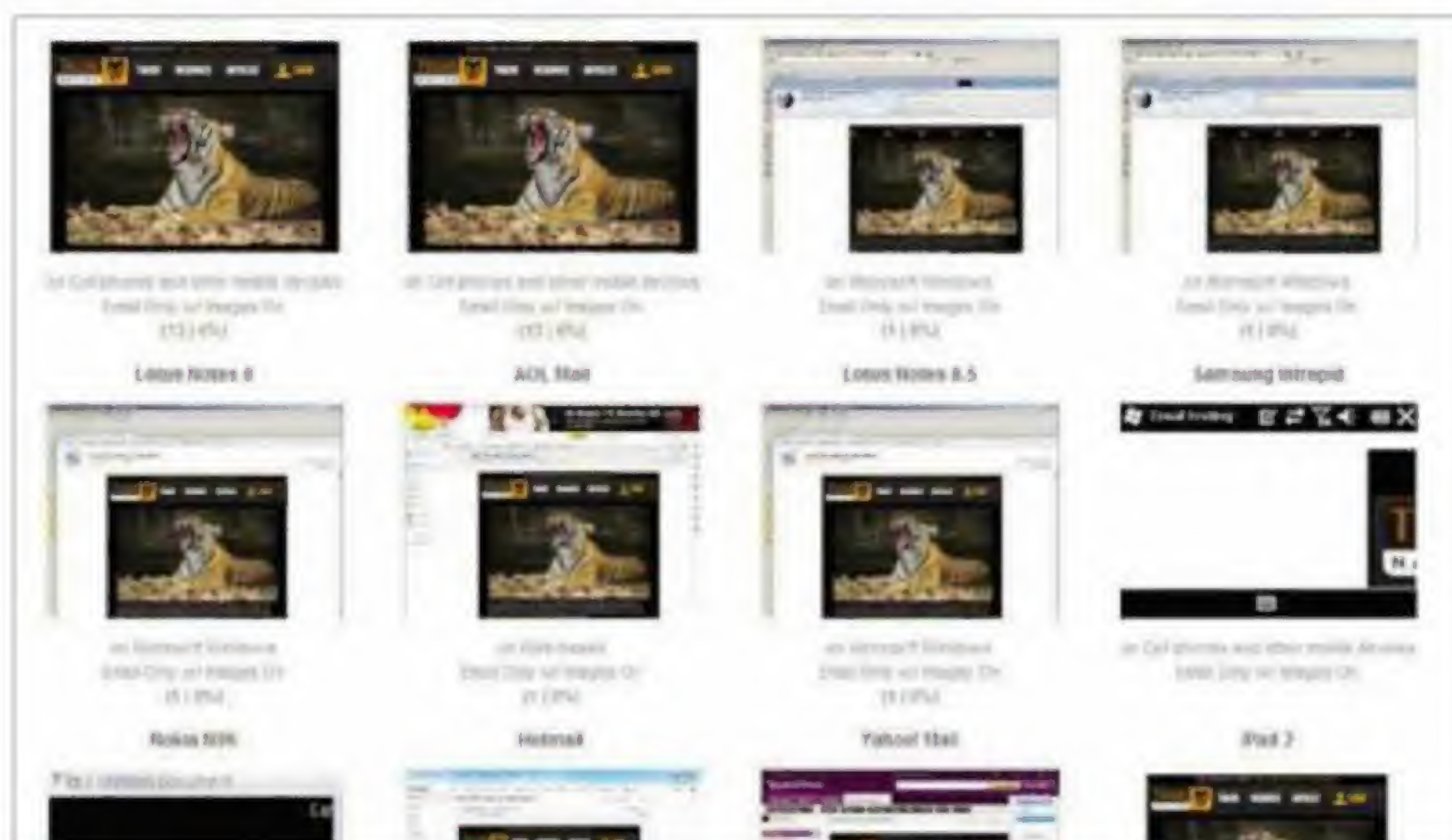


- **MailChimp allows you to see which parts of your design are pulling their weight**

in every email campaign you send. Bear in mind that images should be referenced in HTML with absolute URLs (“http://www.pcpro.co.uk/image.png”, for instance).

You can use MailChimp to host images, too, which will save your web host from a sudden influx of traffic if 10,000 newsletter recipients all attempt to download the same images at once. This involves nothing more than hovering over an image box in a template and clicking Edit. A dialog will appear, offering a drag-and-drop target that allows you to upload JPEG and PNG files. You can host images elsewhere, of course – other options include entering a URL, using Flickr, and browsing iStockphoto for paid-for professional options.

When creating your template, we suggest you use the least complicated HTML editor possible to minimise unnecessary auto-generated CSS and HTML code, which may yield unpredictable results when viewed in a



- **Inbox Inspector creates previews of how your emails will appear in various clients**



mail client. Don't attempt to create a layout in Word or Publisher and export it as an HTML file; the code is likely to be cluttered with unnecessary tags and certainly isn't guaranteed to display properly. For two free alternatives, see *HTML editing on a budget*, below.

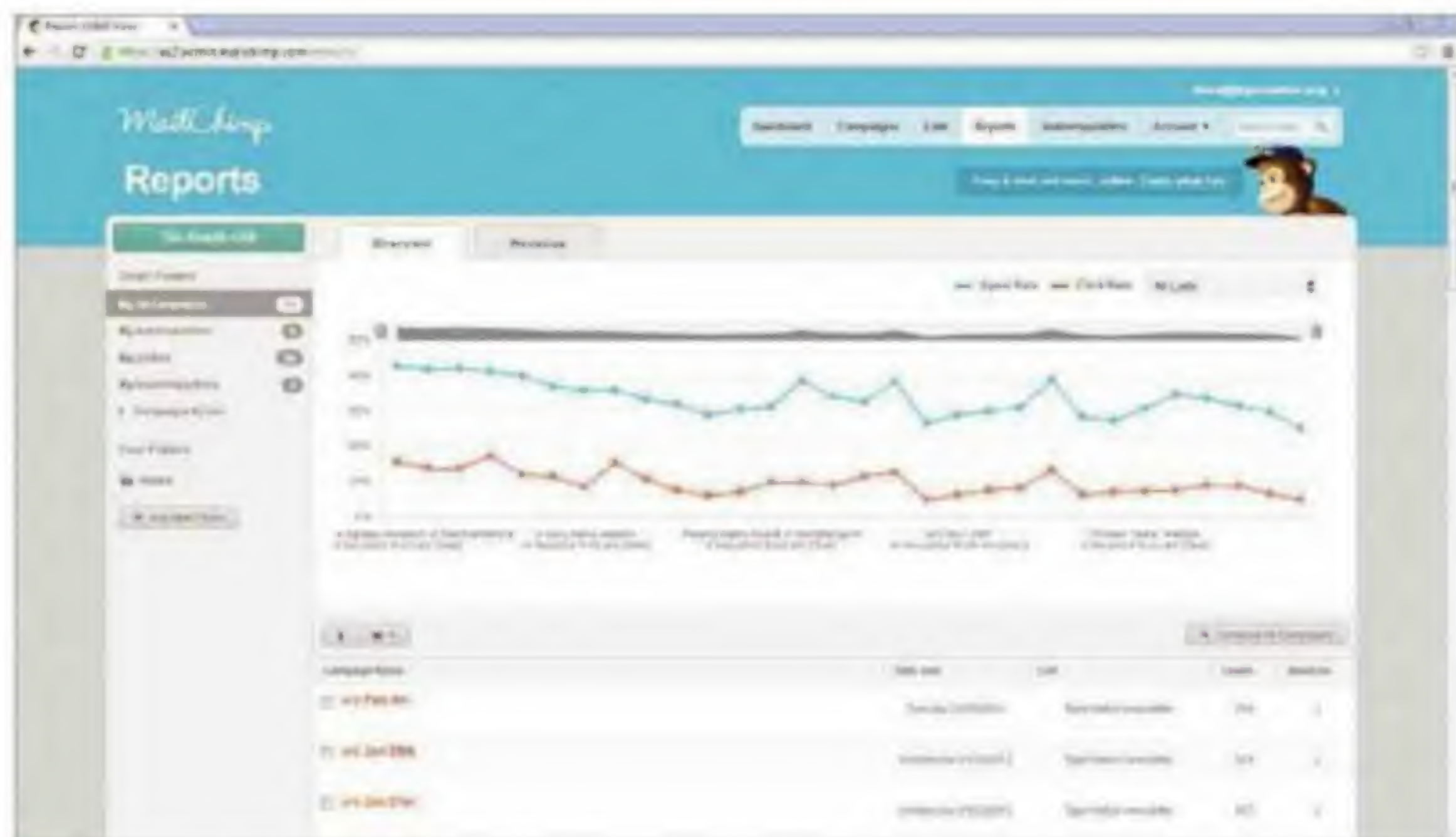
## Testing and troubleshooting

Once your template is looking good in MailChimp's internal editor, it's time to check how it will look to your recipients. This is a bigger job than it sounds. Different email clients handle HTML code and layout in different ways: for example, Outlook 2013 renders email using Word's HTML engine and will ignore background images. Testing on the myriad versions of Outlook, Apple Mail, Mozilla Thunderbird and the multitude of web clients out there would be a nightmare.

The answer is MailChimp's Inbox Inspector tool, which quickly and automatically creates previews of how your email will appear in a variety of clients. For users signed up to one of MailChimp's monthly paid-for accounts, Inbox Inspector is free. For free users, an Inbox Inspection costs \$3 (around £2). You can see what your email looks like in each client, and track down problems. You can also see each preview as it will appear if the user doesn't download images, or if they open your email in a separate window. Fixing the problems you find can still be a pain, but the benefit of working with a template is that you'll only need to get it right once.

## Interpreting reports

Open rates for marketing emails hover around the 20% mark for most industries; the rates at which people actually follow links contained in those emails are much lower, often coming in



● The Reports tab contains valuable data about how your email campaigns are working

below 5%. To maximise your chances of attracting one of those hard-earned clicks, it's crucial to understand how recipients interact with your messages. That's why MailChimp's reports are perhaps its most valuable feature.

Head to MailChimp's Reports tab and the first thing you're given is a useful graph representing all the email campaigns you've sent. The graph shows two lines: one for the percentage of recipients who opened your email; and another for the percentage of users who clicked on something. The more email campaigns you send, the more useful this graph is, since it allows you to spot trends based on subject line, delivery day and so on.

### Party pooper

If you find MailChimp's tone overly familiar, go to My Account, then My Defaults, then select "Party Pooper Mode": the cutesy talking chimp graphic is removed, and the word "bummer" disappears from MailChimp's vocabulary. Useful if you're setting up MailChimp for a straight-faced client, or if you're just sick of the monkey.

For the detail-orientated, though, there are plenty of extra numbers available that can help when it comes to encouraging greater engagement from your readers. Clicking on a specific email in MailChimp's Report tab produces a wealth of data about that campaign.

Click on Trends under Subscriber

Activity, for example, and you can see a breakdown of the times of day at which people opened your email.

You can also check which parts of your email are generating the most clicks. Click Performance lets you see which links in an email performed best, with a graphical overlay showing the percentage of people who clicked on each link.

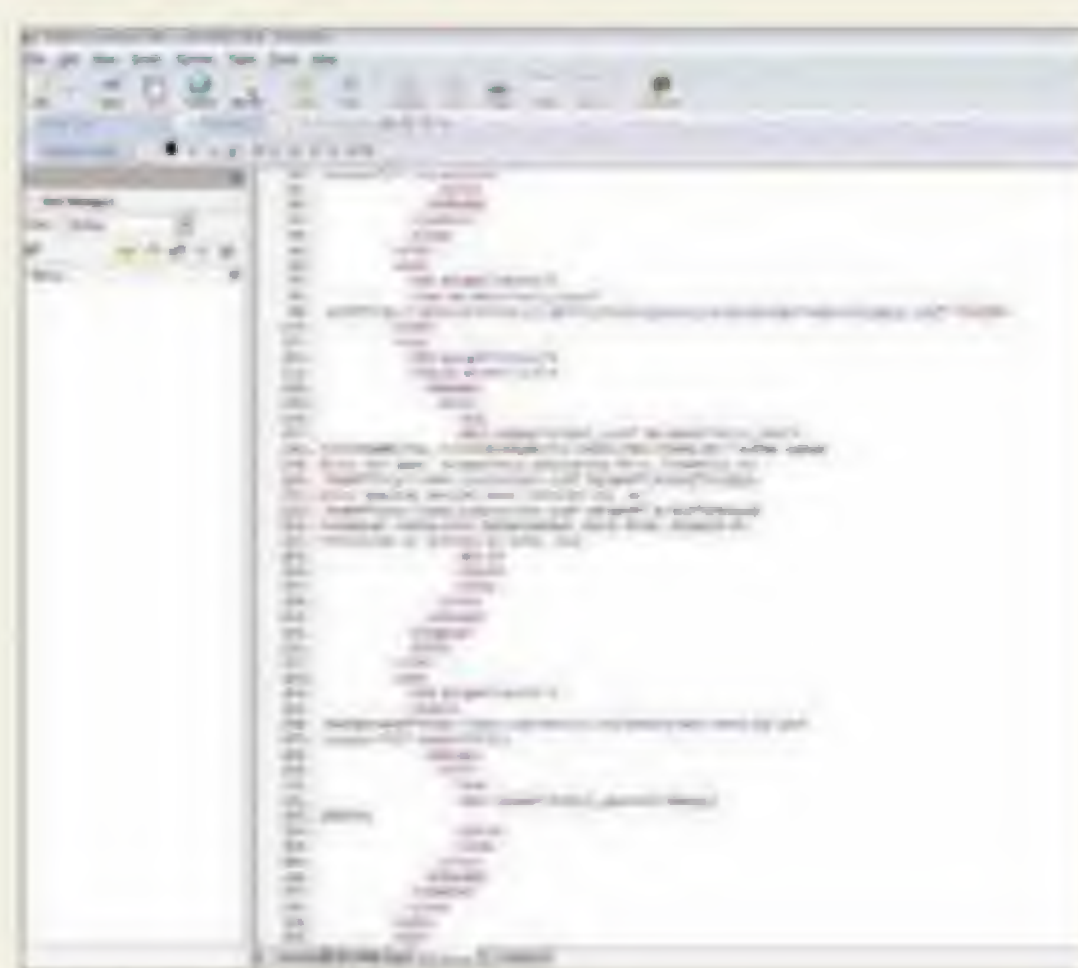
This could help you identify a part of your design that's being overlooked by recipients, for example.

## HTML editing on a budget

There are plenty of professional website-design packages available, but they're typically priced for professional web designers. If you just need to create the occasional email campaign, a package such as Adobe Dreamweaver or NetObjects Fusion is overkill.

One handy, free alternative is KompoZer ([www.kompozer.net](http://www.kompozer.net)). Your HTML and CSS code is updated in a live preview window, while commonly used snippets of code, such as <TABLE>, <IMG SRC...> and so on, can be added and modified via the menu bar at the top of the screen.

Another option is Mozilla's open-source SeaMonkey Composer ([www.seamonkey-project.org/releases](http://www.seamonkey-project.org/releases)). You can type and edit text in a wysiwyg environment and,



using the tabs at the bottom of the pane, switch to Source view to check and clean up your code.

## Upgrading MailChimp

You can open a free MailChimp account and start sending emails without paying a penny. Free accounts have a few restrictions, however. As a free user, you can sign up a maximum of 2,000 members to your list, and send out only 12,000 emails per month. In addition, MailChimp's logo will be appended to the bottom of every email sent, which may discourage companies that don't want to share their branding.

MailChimp also offers various pay-as-you-go and monthly accounts. For users sending weekly newsletters, an account costing \$10 per month (around £6) allows you to send an unlimited number of non-MailChimp-branded emails to up to 500 users. The price rises as you add subscribers: a list of 501-1,000 costs \$15 per month, while big companies targeting mass audiences can pay thousands of dollars.



## Create a mailing list in MailChimp



**1** Starting a list in MailChimp is simple. Click Lists in MailChimp's menu bar, then Create Your First List. Give the list a name that will still make sense to you in six months, and make sure you put something descriptive in the fourth box down to remind people how they got on your list – this should discourage spam complaints.



**2** To comply with US legislation, MailChimp includes your physical postal address on every mail you send out. This is something to think about if you run your business from home; the cautious may consider using an obliging accountant or solicitor as a "c/o" address, if you don't want to share your personal address.



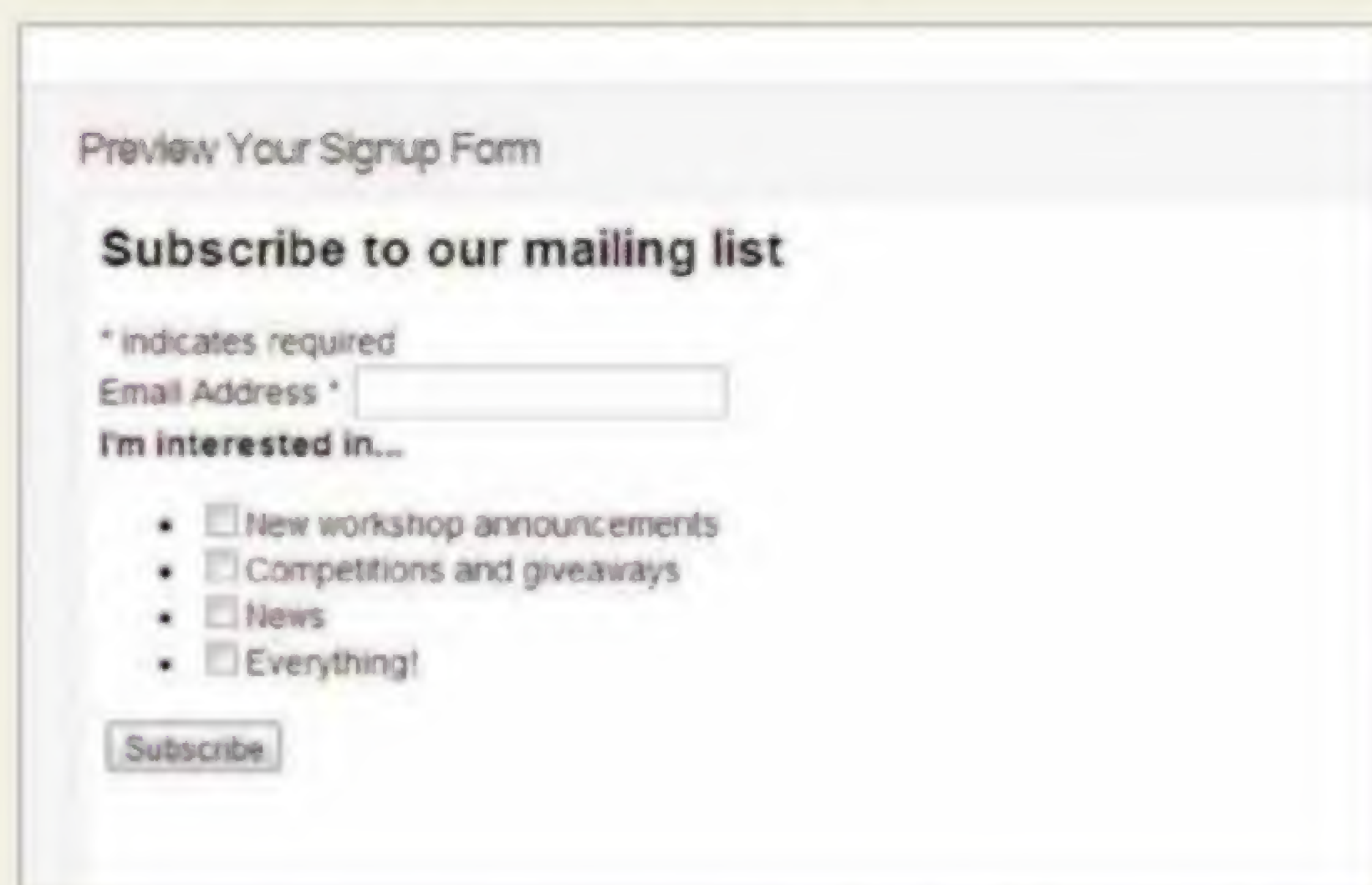
**3** Sorting your users into groups allows you to target your emails to people with specific interests. It's best to make a start on this before your list starts gathering steam, to avoid the need to reorganise things later. To do so, click on the cog next to your mailing list's name and choose Create Groups.



**4** You can make your groups invisible to the users of your mailing list, or you can allow signees to categorise themselves. If you offer checkboxes, subscribers will be able to join more than one group when they sign up, while radio buttons or a dropdown list will allow people to choose one group only.



**5** Next, create a sign-up form via the Create Forms option. By default, MailChimp asks for a full name and email address; you can add extra text fields and buttons if you want to request more information. The form will be hosted by MailChimp, but the Auto-Design option tries to match the colours of your own website.



**6** If you'd rather host the sign-up form yourself, open the "For your website" dropdown box in the List Manager and click Create Form Embed Code to copy the HTML. For more control, click Classic Form on the left-hand side: this has more code to copy and paste, but it uses CSS, so customising its appearance is easier.



## HANDS ON

# Can I delete it? How to save disk space

**Darien Graham-Smith** helps you squeeze more from your storage by finding and removing unneeded files

A few years ago, it seemed disk space woes were firmly behind us. Desktop drives offered terabytes of storage for almost-pocket-money prices, and even mid-range laptops came with hundreds of gigabytes of capacity.

Yet today many of us are feeling the squeeze. We're building up ever-larger libraries of photos and movies, and at the same time, PCs and tablets have moved from mechanical drives to faster – but much smaller – solid-state disks. Modern desktop systems tend to come with a secondary mechanical disk for data storage, but compact laptops and tablets simply don't have the space for a second hard disk. You're left with as little as 64GB of solid-state storage in total, which in practice leaves very little room for your data (see *Where have my gigabytes gone?*, p62).

There are ways to make space, however. On these pages we'll show you how to squeeze the most out of a small hard disk, find and eliminate unnecessary files, and reduce the amount of space Windows itself demands. You may be surprised at how much space can be freed up with a bit of smart housekeeping.

## Finding spare disk space

Before you start to delete files, it's worth seeing whether you can make more of the capacity of the drive itself. A system that's been in use for some time could well contain one or more unneeded partitions – perhaps an old Ubuntu installation, or, if you're using a MacBook, a Boot Camp partition. Such partitions can be easily deleted, and their space reclaimed. Many devices also come with a recovery partition, which you may choose to remove. This isn't a decision to take lightly, though.

To delete a partition, you'll want to use the Disk Management console. To find it, search Windows for "Create and format hard disk partitions": in the window that opens, click on your system disk in the top pane and look at its layout in the bottom pane. If you see an unwanted partition, simply right-click and select "Delete volume..." to remove it. Then, to assimilate the space you've just freed up into



your main Windows disk, right-click on your system partition, select "Extend volume..." and choose the maximum extension available.

A few caveats are necessary. It goes without saying that before deleting a partition you should make absolutely certain you don't need its contents. Once you've subsumed the space into your main system partition, there's no easy way to recover the data it contained. We should also point out that all partition operations carry a tiny element of risk: you might want to check your disk for errors before reorganising the partitions, and if you're using a battery-powered device, make sure it's connected to the mains before embarking on any repartitioning tasks.

## Remove unneeded applications

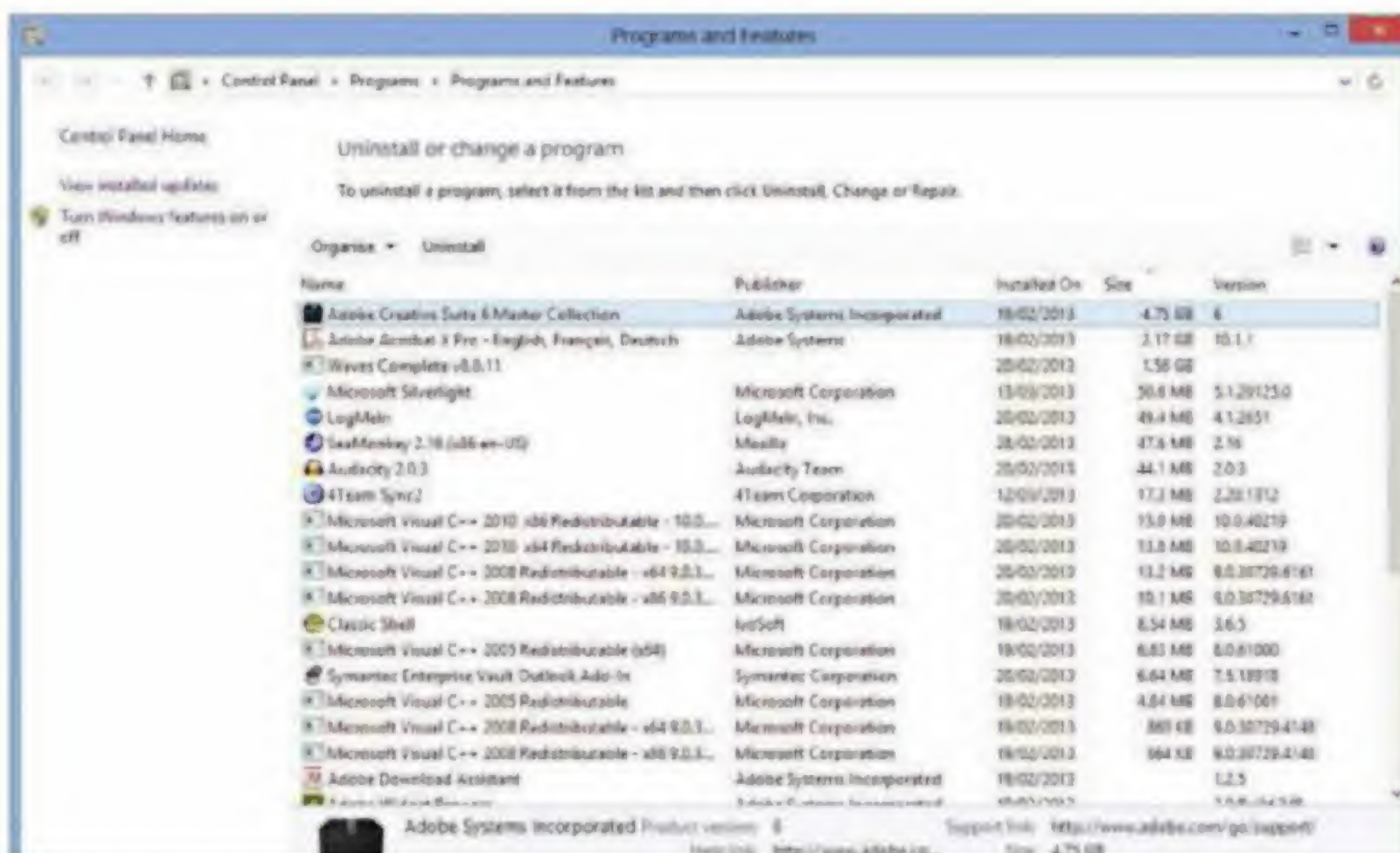
Now you've maximised your available space, the next step is to clear out any programs you don't need. To do this, go to the control panel, open the Programs And Features window to see

a list of installed software. The Size column shows the total size each application takes up across your disk – something that may not otherwise be easy to work out, as program files tend to be spread across several disk locations.

By glancing down the Size column you can easily see if an application is taking up an inordinate amount of space, and decide whether to uninstall it – or perhaps, if it's a modular installation, simply remove some components. Microsoft Office and Adobe Creative Suite are examples of packages where a full installation can take up several gigabytes of space, but requirements can be slashed if you pare down your installation to the components you need. Ideally, of course, you should remove all unneeded applications, however large or small. Even if the space saving is minimal, removing surplus software makes it less likely you'll be affected by security vulnerabilities.

At the left of the Programs And Features pane, you'll also see a link inviting you to "Turn Windows features on or off". This may





➤ **An application suite can eat up a lot of space, especially if you install unnecessary components**

sound like a promising way to squeeze more space out of your system, but sadly there's no space to be saved here: turning off a Windows feature doesn't remove it (so you can turn it back on again if you change your mind later).

### Cleaning up leftover files

The next step is to clear out any unneeded files that may have left been hanging around on your disk, either by applications that have now been removed, or by Windows itself. You can do this by hand, but we don't recommend it. A more efficient approach is to use Windows' built-in Disk Cleanup tool (or Disk Clean-up, as it's called in some versions of Windows): this can free up gigabytes of space by automatically removing all sorts of digital detritus, including log files and Windows 8 File History items. When you first launch the program (simply search for its name), you'll see that not all of these options are activated by default, but you can enable them by simply ticking the relevant boxes in the interface – click on the name of an option to see a description of what it does. If you click the "Clean up system files" button, additional administrator-only cleanup options will become available.

You can't break your PC by using Disk Cleanup, but there are options that should be used with care. One example is the "Previous Windows installations" option: if you've upgraded from an older version

of Windows, selecting this option tells Disk Cleanup to remove the C:\Windows.old folder that contains your old system files. This may sound like a good idea, but the folder also contains your old desktop and personal folders. If you haven't already copied all your old data, check C:\Windows.old\Users\[Your name] to rescue anything you might still want before you allow Disk Cleanup to erase it.

Another option that shouldn't be used lightly is wiping the Windows 8 File History cache. This erases cached information that hasn't yet been written to your backup disk. Ticking it will temporarily save space on your hard disk, but it will also reduce the completeness of your File History.

Disk Cleanup also offers a shortcut to the System Restore settings, from where you can save more space by deleting older restore points – you'll find the button under the More Options tab. Depending on how you use your PC, this can clean up several gigabytes, but it's only temporary. Over time, System Restore will continue to track changes to your PC and once again build up its database, by default consuming up to 5% of your hard disk space.

If you want to limit the amount of storage used by System Restore, open its settings pane



➤ **Disk Cleanup lets you remove unneeded files with a few clicks**

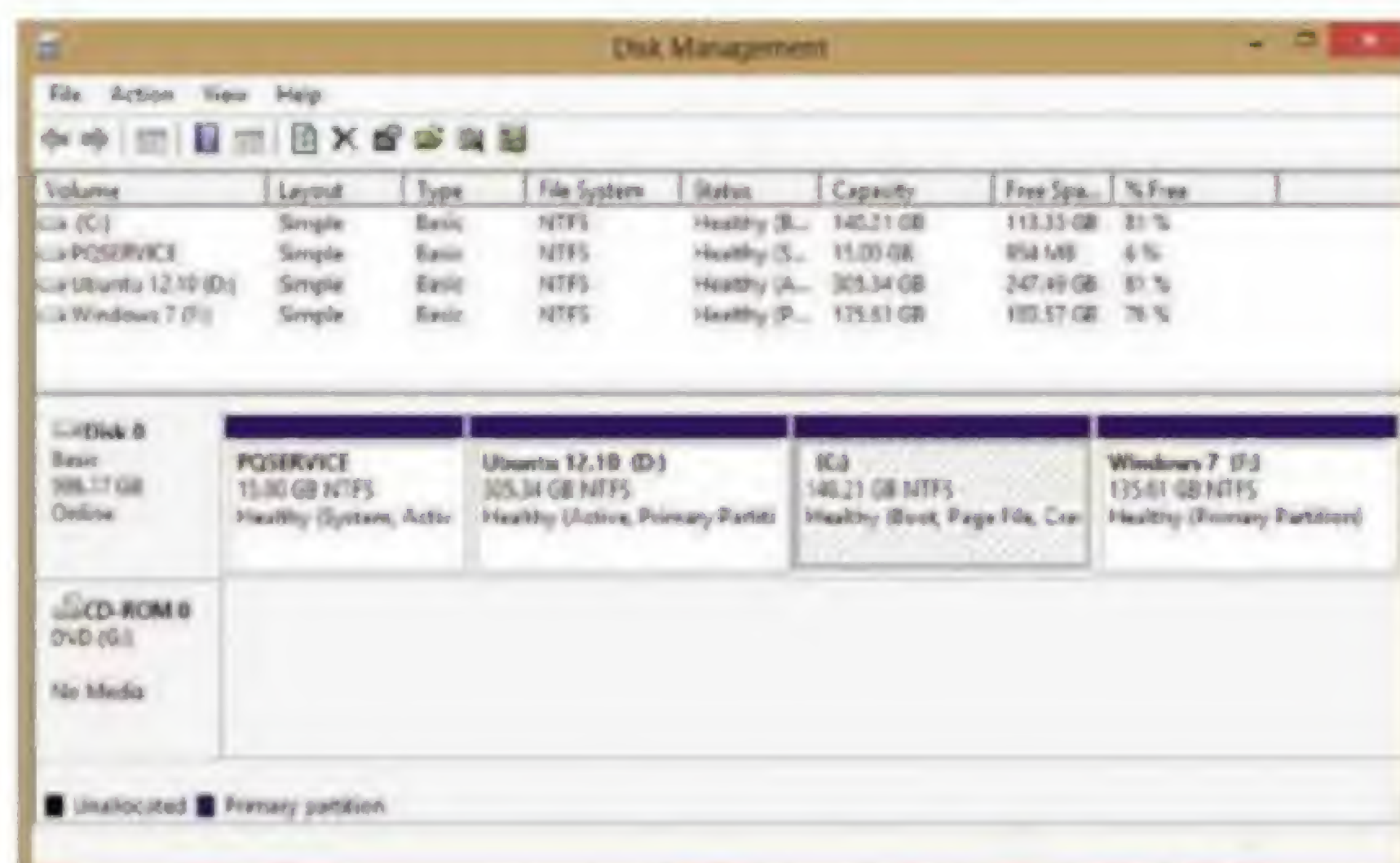
– you'll find it under System Protection within the System Properties control panel item – and click Configure. You'll see a slider that can be dialled back to a minimum of 1%. The trade-off is of course that fewer historical restore points will be available in future, should you need to make use of the feature.

If you want to make sure you've wiped every last unneeded file from your PC, consider making a second pass with a third-party disk cleanup tool. One popular option is Piriform's CCleaner ([www.piriform.com/ccleaner](http://www.piriform.com/ccleaner)). This small utility recognises and deletes unneeded files created by a wide range of third-party applications, so it may spot space-saving opportunities that are missed by Disk Cleanup.

### Finding unneeded personal files

It's now time to take the axe to your own data files – or at least to check for any large ones that can be safely deleted or archived off to an external disk. This may seem a daunting task, as personal files tend to end up scattered across multiple locations, or buried away in subfolders. Happily, there's a popular tool that makes it easy to see where all your space has gone. It's called WinDirStat (short for Windows Directory Statistics) – a free, open-source utility that you can download from <http://windirstat.info>. Install the software, run it, point it at your system drive and click OK: the tool will carry out a thorough scan and in no more than a few minutes will produce a visual map of your disk, represented as an assortment of coloured rectangles, along with a tree-style interface in the top half of the window.

Reading the WinDirStat map is easy. Each rectangle represents a single file; its size reflects how much disk space it occupies; and its colour shows its file extension, so you can see at a glance whether it's (for example) an ISO disk image or an AVI video. Click on a rectangle and you'll see it highlighted in the directory tree ➤



➤ **From the Disk Management console, you can remove unwanted partitions**



pane, showing its location on the disk, its size and various other properties.

In this way you can quickly identify the largest files on your hard disk, and make a judgement as to whether or not you want to keep each one (to remove a file, right-click on its name in the tree view and select Delete from the context menu). Note that many you'll find will be system files, and can't be directly removed: in particular, two of the largest files you're likely to see will be C:\PAGEFILE.SYS and C:\HIBERFIL.SYS, which we'll discuss below.

Removing your biggest personal files can yield substantial space savings in only a few clicks, but what if you have a folder made up of a great many files, each one small in isolation but representing a big waste of space overall? This won't be so obvious in WinDirStat's map view, but you can easily spot it by looking at the tree view. By default this shows all the folders in the root directory of your hard disk, arranged in order of size – typically the top three entries might be C:\Windows, C:\Users and C:\Program Files. The columns to the right of the folder names show what percentage of your disk usage is represented by each folder, and the absolute size in gigabytes.

Click on C:\Users, and you'll see a white border appear on the map showing the extent of all its contents. Click the "+" icon in the tree view and you'll see the subfolders of C:\Users, again sorted in order of size (along with a "<Files>" entry representing the size of the files located in that folder). By drilling down into the folder structure you'll be able to find and audit the folders taking up the most space.

If you want to cull every last byte of unneeded personal data, you may want to finish up by going into Windows Explorer and carrying out a manual survey of your desktop, your Downloads folder and your Libraries. This probably won't have a huge impact, since any particularly large files and folders should already have been brought to your attention in WinDirStat, but getting rid of smaller unneeded files keeps things neat and tidy. Don't forget to empty the Recycle Bin when you're finished – an obvious tip, but one that's easy to overlook.

WinDirStat isn't the only tool of its type: a popular free alternative is Uderzo Software's SpaceSniffer ([www.pcpro.co.uk/links/225idp](http://www.pcpro.co.uk/links/225idp)).

## "Getting rid of smaller unneeded files keeps things neat and tidy"

This creates a map similar to WinDirStat's, and labels its rectangles directly, so you can get a high-level overview of file distribution at a glance. However, we find its hierarchical approach – which requires you to click into folders to see their contents – is less convenient for tracking down space-wasting files.



● The free WinDirStat makes it easy to identify the largest space-wasting files on your system

### The hibernation file and the page file

We've mentioned above that two of the biggest space hogs you're likely to find on your PC are HIBERFIL.SYS and PAGEFILE.SYS. You can't delete these files directly, but it's possible to get rid of one, and shrink the other.

The one that can be removed is HIBERFIL.SYS – a container file that stores the contents of your RAM when your PC enters hibernation mode (you'll notice that its size is exactly the same as your computer's physical memory). You can get rid of it by simply disabling Windows' hibernation feature, although of course this means losing a potentially useful power-saving feature.

To achieve this, all you have to do is open an elevated command prompt (search for CMD.EXE, then right-click on the icon and select "Run as administrator"), then enter a single command:

```
powercfg /hibernate off
```

This will remove HIBERFIL.SYS, immediately freeing up its disk space.

PAGEFILE.SYS works in a broadly similar way: this is the file Windows uses for virtual memory, so it serves as an extension of your physical RAM. If you're using default settings, this file can grow and shrink, but it's typically a significant fraction of

the size of your physical RAM. If you're stuck on a 64GB SSD, a 4GB page file isn't helpful.

You can change the size of the page file by visiting the Advanced tab of the System Properties, clicking on the top Settings button (in the Performance section of the interface), then clicking Advanced | Change... and

unticking the "Automatically manage paging file size for all drives" box. You can now click Custom Size to specify a maximum size for your page file, or you can click "No paging file" to get rid of PAGEFILE.SYS altogether. Once you've made your choice, click Set and OK to apply your new values. When you next restart Windows, the page file will be shrunk or gone, freeing up disk space.

Be aware that running Windows with little or no virtual memory isn't a great idea. It increases the risk of Windows running out of memory at some point – an eventuality that can cause the OS and applications to crash or behave unexpectedly. If your computing needs are modest, however, you may well be able to disable the page file without a problem, especially if you're using a system with 8GB or 16GB of RAM, which far exceeds the demands of most modern applications.

### System folders you can't remove

While exploring your disk for unneeded files, you may notice a large folder called C:\Windows\WinSxS, potentially taking up 10GB or more. Inside it you'll find a large number of subfolders, each containing a handful of system resources, such as DLLs, driver files and so forth – many of them apparently duplicates of files found elsewhere on your PC. This may look like a huge waste of space, but in reality things aren't as bad as they appear.

To explain, the WinSxS folder is part of a system introduced in Vista called "side-by-side" that allows multiple versions of system files to be installed simultaneously – a solution to the "DLL Hell" problem of old, where different applications demanded conflicting versions of a resource. The WinSxS folder now serves as a central repository for all of your Windows



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## The ProLite **B2481HS**

The ProLite **B2481HS** is a high specification **24" Full HD** 1920 x 1080p LED-backlit monitor with **super slim** (7 mm) bezel. It comes with a 13cm **Height Adjustable Stand** which supports **Screen Rotation**, ensuring perfect posture and optimal viewing which makes it ideal for **Video Conferencing, DTP** and **CAD** as well as the usual text based applications. It features 2ms response time and >5 000 000 : 1 Advanced Contrast Ratio assuring clear and vibrant picture quality. Triple Input support of Analogue, DVI and HDMI ensures compatibility with the latest installed graphics cards and embedded notebook outputs. The monitor is **Energy Star** and **TCO Certified**. A reliable solution for all kind of work environments where ergonomics and best performance are desired.



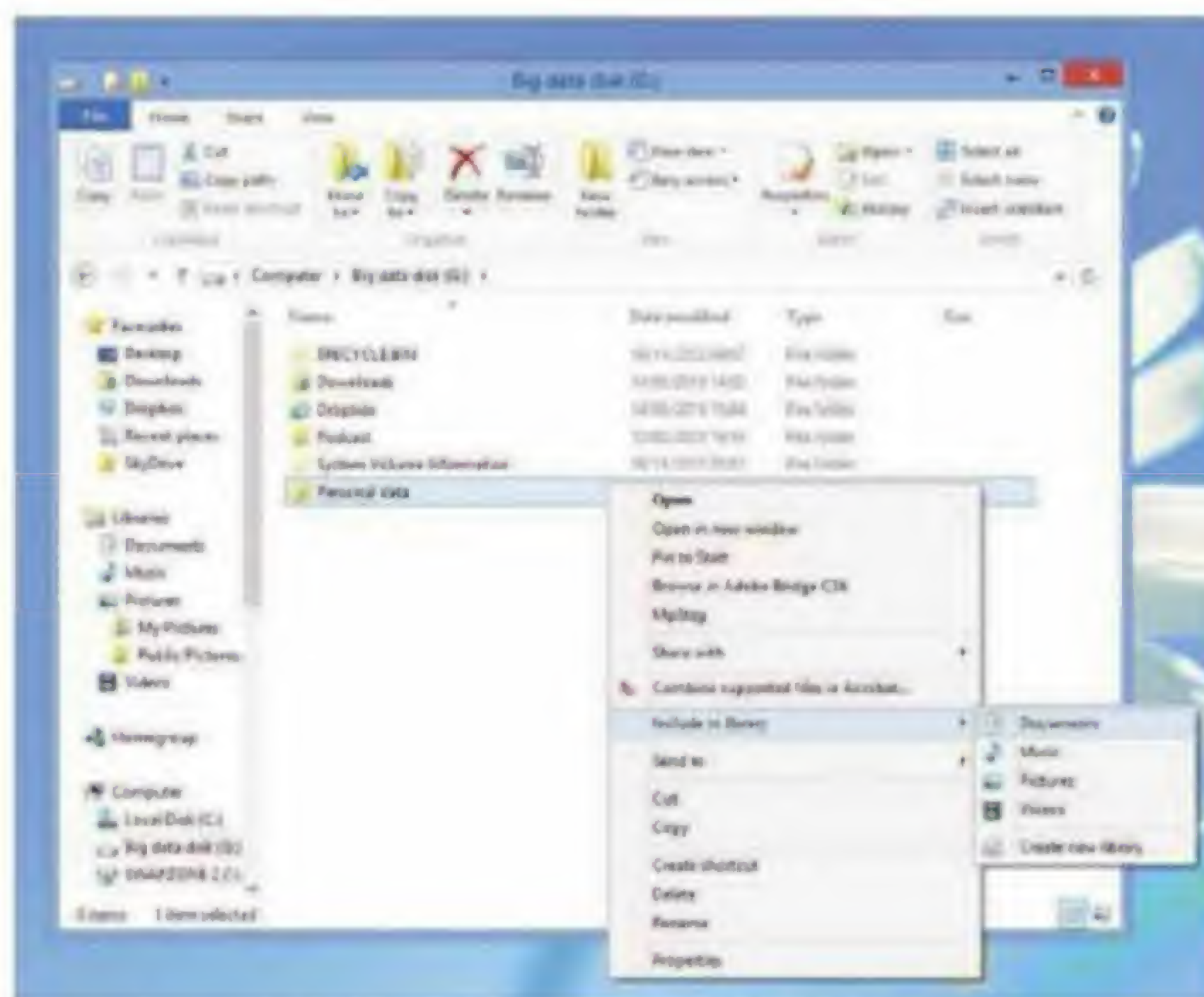
system components, including multiple versions of DLLs where these have been installed. These components are linked – not copied – to the appropriate locations on your hard disk; so while your Windows folder may appear to contain many redundant duplicates of system files, in reality there's only one physical copy of each file on your disk, and no space is wasted.

While you can't get rid of the WinSxS folder, you may be able to shrink it if it contains outdated versions of files that are no longer needed. You can achieve this using Microsoft's DISM tool: simply enter the following commands at an elevated command prompt:

```
dism /online /cleanup-image /
spsuperseded
dism /online /cleanup-image /
startcomponentcleanup
```

This will cleanly remove any backups and old components that have been superseded by the installation of a Service Pack. You'll need to restart Windows once it's been run, but it's well worth doing: on our test PC, we saw the WinSxS folder shrink from 10.6GB to 9.3GB.

Another comparatively large folder you may see is SysWOW64: this is found only on 64-bit



Work across drives by adding external folders to Libraries

systems, and contains the components needed for running 32-bit software on a 64-bit operating system (the name stands for "Windows on Windows 64"). The folder may take up around a gigabyte, but even if you run only 64-bit applications it's considered a necessary system folder, and Windows won't let you remove it. If you need to install Windows on a device with very little storage, you may

therefore wish to consider using a 32-bit edition to save space.

## Working with a secondary drive

Sometimes, despite one's best efforts, it isn't possible to fit everything onto your system drive. If you need to work with a large library of data, you may have no practical option but to move it off your primary drive. If you're using a desktop, this might be an internal mechanical drive; on a laptop you might choose

to use an external drive, an SD card or a USB flash drive – although these last two options may be rather slow. Alternatively, you can use a cloud service such as SkyDrive to store your data: this is probably the slowest option of all, and presupposes a constant internet connection.

Whichever you choose, the overall difference to your productivity shouldn't be too severe. If you're using Windows 7 or 8, you can easily access folders on your secondary drive by including them in a Library. Simply locate the folder you want to work with in Explorer, right-click it and select the "Include in Library" item. You can create new Libraries, and edit existing ones, by right-clicking on the Libraries heading, or on individual Library links, in the left-hand pane of any Explorer window.

If you want to take things a step further, it is technically possible to move your user folder onto a secondary disk. This can free up a lot of space, since it involves moving the AppData folder, which contains personal application settings, resources and temporary files – a set of files that can easily run to several gigabytes. But this process isn't supported by Microsoft, and with good reason: if the drive containing your settings and resources isn't available for any reason, Windows and your applications won't run correctly. If you're sure you want to do it, the process isn't hard: simply log onto Windows using a different Windows account, move your user folder to a new location, then open the command prompt and create a symbolic link leading from the old location to the new one. For example, you might type:

```
mklink /D C:\Users\Edward G:\Users\
Edward
```

Now, when you log back in as Edward, Windows will attempt to access your personal data at C:\Users\Edward, and will be transparently forwarded to the linked folder on your secondary drive.

## Where have my gigabytes gone?

When you buy a new PC or laptop, the space available for your files may be less than you'd expect. A current case in point is Microsoft's Surface Pro: the 128GB model comes with only 89GB of free space, while customers choosing the 64GB incarnation receive a mere 29GB of space for their own files and downloads. What gives?

The problem starts with the way storage is measured, because not everyone agrees on exactly how big a kilobyte is. The traditional view is that a kilobyte is 1,024 bytes, a megabyte is 1,024 kilobytes and so forth – this being a convenient scale for binary calculations. Windows conforms to this convention, so it considers 128GB of storage to equal  $128 \times 1,024 \times 1,024 \times 1,024 = 137,438,953,472$  bytes of data.

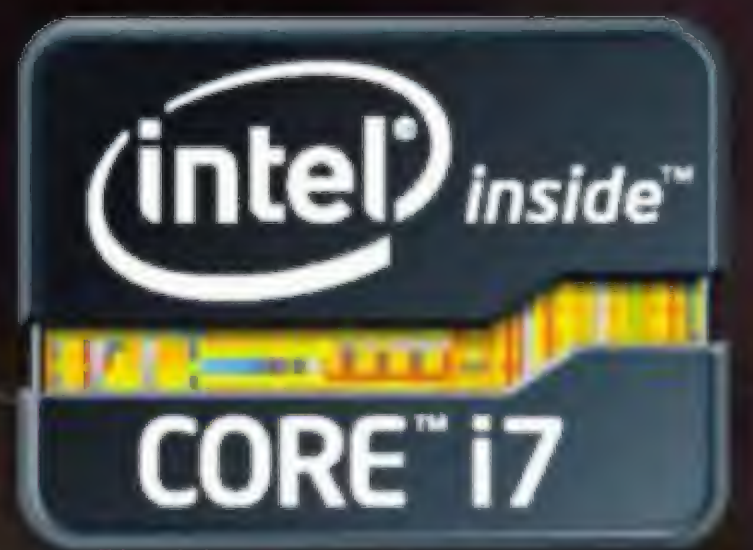
Hard disk manufacturers, however, prefer to use powers of 1,000. A hard disk that's advertised as having a 128GB capacity will in fact hold  $128 \times 1,000 \times 1,000 \times 1,000 = 128,000,000,000$  bytes of data. That's quite a big shortfall: to Windows this appears as only 119GB of capacity. Right off the bat you've "lost" 9GB of capacity.

On top of this comes the fact that at least 4GB of your hard disk may have been sectioned off as a recovery partition,

enabling you to easily restore the system to its factory settings should you need to. It is possible to remove this partition and reclaim the space for your files (see *main text*), but make sure you have some alternate means of reinstalling Windows before doing so. Also check that you have copies of any necessary hardware-specific drivers and utilities. Re-imaging your system from the recovery partition will restore these by default, but if you reinstall from a generic Windows DVD, they may not be included.

A third factor that eats away at your available space is Windows itself, along with whatever applications the manufacturer has preinstalled. On an Android tablet or an iPad, the OS demands around 2GB of storage, but a full Windows 8 installation comprises more than 6GB of core files, with the page file and hibernation files adding many gigabytes on top of that. As we describe in the main text, you can remove unneeded files and features, and remove unwanted applications, but you'll never be able to make Windows as lean as an operating system that was designed primarily for mobile devices. That's the price you pay for having a full OS that supports both desktop and tablet apps.





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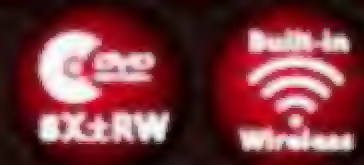
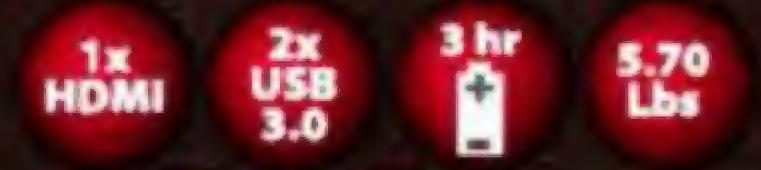
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# COVER DISC

THIS MONTH'S CD & DVD – JULY 2013

**Back up your files, customise screengrabs and protect your PC with this month's software**

ON THE CD & DVD: FULL PRODUCTS

## Genie Timeline Professional 2012

Genie Timeline Professional 2012 is a backup tool that's packed with options, and it's easy to get started thanks to Genie's Smart Selection feature. It automatically scans your PC for different types of file, from pictures and emails, to videos and financial documents, so you don't have to hunt down individual documents.

Backups can be password-protected with 256-bit AES encryption and stored on both local and network drives, with compression options available to help you save space.

Genie Timeline Professional 2012 includes more features than the Basic version we've previously included on the *PC Pro* cover disc. Your backups can be automatically updated as often as every three minutes, rather than at 30-minute intervals. Advanced filtering, power-saving options, and settings to prevent file duplication are only available in Genie Timeline Professional 2012.

*PC Pro* readers can upgrade to Genie Timeline Professional 2013 for £20 rather than £45. The latest version includes backup searching, an updated interface, and the option to remove deleted files from backups. To upgrade, visit the *PC Pro* Software Store at [www.pcpro.co.uk/links/225genie](http://www.pcpro.co.uk/links/225genie).

**INFORMATION** As sold for £45; requires Windows 8/7/Vista/XP, and online registration



### Genie Timeline Professional 2012



Genie's three-step wizard makes even complex backup jobs simple. Backups can be stored locally or on network drives



The app's Smart Selection tool can be used to gather together specific types of file, making backup operations easier than ever



It's also possible to sift through your hard disk and choose individual files and folders to back up





### How to register

To register an application, open its page on the cover disc and follow the instructions in the Registration section

For full listing, go to:  
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### Movavi Screen Capture 4



Customisable window sizes, audio feeds and video options make it easy to capture screenshots and record PC operations

### Movavi Screen Capture 4

It's easy enough to take a simple screenshot, but Movavi Screen Capture 4 goes beyond the Print Screen button thanks to several powerful options – as well as the ability to record video of what's happening on your PC. A wide range of customisable window sizes can be used to capture either screenshots or video recordings, with audio from a choice of sources.

Various frame rates are available, to provide an appropriate balance between smoothness and file size, and effects can be used to highlight cursor movement and mouse clicks – handy for recording instructional videos. Recorded videos can be saved as AVI, WMV or MPEG files, and can be automatically sized for iPhone and iPad use.

PC Pro readers can take advantage of an upgrade offer, too – an upgrade to Movavi Video Suite for £45 rather than £65. The upgraded software includes 2D and 3D effects, DVD ripping and conversion between file formats. To upgrade, head to [www.pcpro.co.uk/links/225movavi](http://www.pcpro.co.uk/links/225movavi).

**INFORMATION** As sold for £24; requires Windows 8/7/Vista/XP, and online registration

### Ashampoo Music Studio 2013



Ashampoo Music Studio lets you convert files between formats, and change the quality levels of your music

### ON THE DVD: BONUS FULL PRODUCTS

### Ashampoo Music Studio 2013

Ashampoo Music Studio 2013 collects together a range of tools for burning, organising and recording music – whether it's from a CD or one of your own creations.

Ashampoo's music-organisation tool can automatically rename and restructure files into a more logical order, and Music Studio 2013's built-in burning capabilities help you quickly create your own audio discs. The suite's modification module can be used to normalise track volumes, and a file converter comes with settings for changing bit-rate and channel options.

There are other tools included in the suite, too: a Cover Editor can be used to create professional-looking CD artwork, and the Record tool lets you capture your own music in your preferred file format, with your chosen quality settings.

**INFORMATION** As sold for £20; requires Windows 8/7/Vista/XP, and online registration

### Bitdefender Antivirus Plus 2013



Bitdefender's interface provides an instant overview of your PC's security, as well as quick access to dozens of options

### Bitdefender Antivirus Plus 2013

Bitdefender Antivirus Plus uses the same security engine as the A-Listed Bitdefender Internet Security 2013, so you know you're getting the very best in malware protection.

That isn't all there is to like. The new Safepay feature offers a secure browser that can protect transactions from keyloggers and screen-scrapers, and an anti-phishing module monitors for dubious online activity. Potentially dangerous sites are flagged in Google and Bing search results, and social networking tools keep your Facebook and Twitter accounts safe. Security scans can be customised with specific files and folders, and options for PC performance levels and scheduling add further versatility.

If you want the most comprehensive protection, upgrade to Bitdefender Total Security 2013 for £20 rather than £55. This includes parental controls, secure cloud storage, file encryption and PC-tuning tools. Visit the PC Pro Software Store at [www.pcpro.co.uk/links/225bitdefender](http://www.pcpro.co.uk/links/225bitdefender).

**INFORMATION** As sold for £25; requires Windows 8/7/Vista/XP, and online registration



# RWC

# REAL WORLD COMPUTING

EXPERT ADVICE FROM OUR PANEL OF IT PROFESSIONALS



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## BUSINESS CLINIC

FREE BUSINESS ADVICE FROM PC PRO'S EXPERTS



Do you need help with a business IT problem? *PC Pro's* Steve Cassidy and Davey Winder will visit your company to deliver free advice on your firm's IT setup. Send details to [businessclinic@pcpro.co.uk](mailto:businessclinic@pcpro.co.uk) and we could pay you a visit!

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## Power lies with the internet giants, not governments, says **DICK POUNTAIN**

**W**hen we look back at the Industrial Revolution of the 18th century, we tend to focus on the steam engine and the railway. When 22nd-century historians look back at the Digital Revolution that began in the late 20th century, it won't be the personal computer they single out, but the microprocessor, the internet and the mobile phone.

Microprocessors supply processing power to increasingly intelligent devices, and the PC will be seen as a brief but crucial phase in the evolution of the microprocessor, until it became small enough to fit inside a smartphone. The rise of the PC was spectacular enough – 1.5 billion over a 30-year period – but the mobile phone reached six billion in 20 years.

The reason four times as many people use mobiles as PCs isn't hard to fathom. Most people have little need in their daily lives for calculation, but communicating with other people, locating and consuming information are central. While both PCs and smartphones can do that, a smartphone can do it from your pocket. There'll always be professionals who need spreadsheets and word processors, but almost everyone has a use for email, SMS, social networks and Google Maps. What's more, mobile-phone masts can be erected even in parts of the world that will never receive a wired internet and phone network. From Mongolia to the Masai Mara, farmers and herders deal direct by mobile and cut out parasitic middlemen; cab drivers find their destination without years of study; engineers no longer carry bulky manuals.

Control of the mobile internet is set to become the hottest of all political issues, in a way that control over the PC never quite was. To be sure, there was a period at the very end of the cold war when the US government tried to deny the Soviet Union access to the latest microprocessors via CoCom, but that apart it's been market forces all the way. Since CoCom ceased in 1994, the world has become a very different place. A handful of giant internet corporations – Facebook, Google, Amazon, Apple, Yahoo, Twitter and the rest – now have annual revenues comparable to those of sovereign states, plus direct access to the hearts and minds of vast swathes of the population of which governments can only dream.

It's no coincidence that every week brings a new rumour that a corporation such as Facebook or Amazon is developing its own

mobile phone. Everyone seems to be thinking about owning the phone or tablet and “forking” Android to run it in their own special way. Most users aren't techies, and don't want to be techies, so if you can sell them a branded phone with your logo and UI veneer on it, that's all they'll ever see. (Rooting and tweaking are strictly for a tiny, nerdy minority.)

There's great power to be had there, and great revenues, too, because unlike the silly old web, mobile networks remembered to build in a payment mechanism. Actually, an outfit the size of Facebook is so ubiquitous, it doesn't need to own the hardware: getting its app onto everyone's phone (of whatever brand) would be enough if it offered Skype-style VoIP calls and messaging, which would start to eat the lunch of the mobile operators themselves, as well as competing social networks.

Katherine Losse was a pioneer Facebook employee who used to ghostwrite posts for Mark Zuckerberg himself, and in her recent book *The Boy Kings*, she offers a disturbing picture of his thinking. The main points of his credo include youthfulness, openness, sharing

**So the model for a new world is the Californian youth-orientated corporation, untrammelled by pesky regulations**

power and “companies over countries”. Asked what he meant by the latter, he told her “it means that the best thing to do now, if you want to change the world, is to start a company. It's the best model for getting things done and bringing your vision to the world.”

So the model for a new world is the Californian youth-orientated corporation, untrammelled by pesky laws and regulations, by messy old-world stuff such as pensions and having to win elections. The nation state is plain out of date; it still practices stupid stuff such as secrecy and taxation, and it doesn't get the New Digital Narcissism, where everyone can be a (unpaid) star of their own channel. All rather reminiscent of the sixties counter-culture, mixed with a dash of Orwell's Oceania, Eurasia and East Asia. Actually, it starts to look rather like a new variation on feudalism, where you'll get fed only if you become a retainer of one of these mega-corporations, as the boring old centralised state and its services wither away.



“

”

**DICK POUNTAIN** edits *PC Pro's* Real World Computing section, and isn't sure whether to become a citizen of Facebook or Google.

**Blog:** [www.dickpountain.co.uk](http://www.dickpountain.co.uk)

**Email:** via <http://about.me/dick.pountain>



## FEATURE

# Choosing the right web-hosting package

**Kevin Partner** guides you through the process of picking the correct hosting package to meet your website's needs

**V**isit any web host's website, and you'll be presented with what may seem like a bewildering array of options. Not only will you be asked to pick from a selection of different types of hosting – shared, dedicated or virtual – but you'll also be asked to decide how much server space, bandwidth and support you need. It's easy to be lulled into paying too much for a package that far exceeds your needs.

With all types of hosting, you're paying a company to store your website on a server, on their premises, connected to the internet. You produce the necessary files using your choice of web design software and upload them to the server (or use a content management system such as WordPress), where visitors can access them by entering your web address into their browser. However, picking the right type of hosting package is crucial.

The differences between the three basic types of web-hosting arrangement are outlined below.

## Shared

As the name suggests, this involves sharing a server with dozens, hundreds or even thousands of other websites. Shared hosting is the cheapest option and usually the easiest to set up, since you're not taking control of a computer, merely adding your files to one that's already set up.

On the other hand, the fact you're sharing the web server means your site's performance can be compromised by the sheer weight of traffic with which the server has to cope. Even if only a few people are trying to view your pages, you'll be affected by the number accessing the other sites on the same server.

That said, a good-quality shared hosting plan is a perfectly sensible choice for many online businesses, including those selling products online or simply using the internet to publicise themselves. You don't have the level of control over your hosting that either virtual or dedicated servers offer, but in many cases you simply don't need it, and you might not have the requisite technical knowledge to take advantage of it even if you did.





If you're looking for the simplest way to get online, think about using a shared service that includes a website builder – MyWebsite from 1&1 (<http://website.1and1.co.uk>) is among the best. However, avoid any service that outputs in Flash, since it makes your site invisible on mobile devices.

You should also bear in mind that the simplicity of these services often results in loss of flexibility when it comes to the design and functionality of your site. For some, this is a price worth paying, but more ambitious businesses could find themselves restricted in what they can achieve.

As you'd expect, the quality of shared hosting varies between providers, and across their product ranges, too. A package costing £3 per month is likely to be aimed at home use; at this level, you can expect to be squashed onto a server with hundreds of other sites and have access to a limited range of features.

Most hosts also offer “business” packages. These include greater bandwidth allowances (so more people can access your site before you start incurring extra costs), more sophisticated management features, and promises of better performance (essentially, good performance is the difference between visitors seeing your website straight away or being left waiting while pages struggle to load).

If you run an online shop, consider a host that specialises in e-commerce, such as Volusion ([www.volusion.co.uk](http://www.volusion.co.uk)) or Bigcommerce ([www.bigcommerce.com](http://www.bigcommerce.com)), since you'll receive access to a top-notch back-office system, design tools set up for retail purposes, and easy payment integration. Again, you'll lose some design flexibility, but, given that the shop designs were created with online selling in mind, they tend to be of good quality. Some web design knowledge is needed, however, to make major changes to the built-in themes.



1&1's MyWebsite is a good example of a shared server service that includes a website builder

### Dedicated

A dedicated server is a physical machine leased by you in its entirety. You're in complete control of your machine through a browser-based control panel and root/admin-level access. These computers usually run Linux or Windows Server.

Dedicated servers are more expensive, with prices starting at around £100 per month, but they're often the right choice if you're developing a web app. In other words, if your core product is delivered to the customer via the internet, rather than being a physical product that's sold online, you'll probably want the extra flexibility and resources that only dedicated servers provide. Dedicated servers

are also worth considering for an online store that aims to attract large numbers of customers, since a shared service will be unlikely to cope with high demand, even in short bursts.

### Virtual

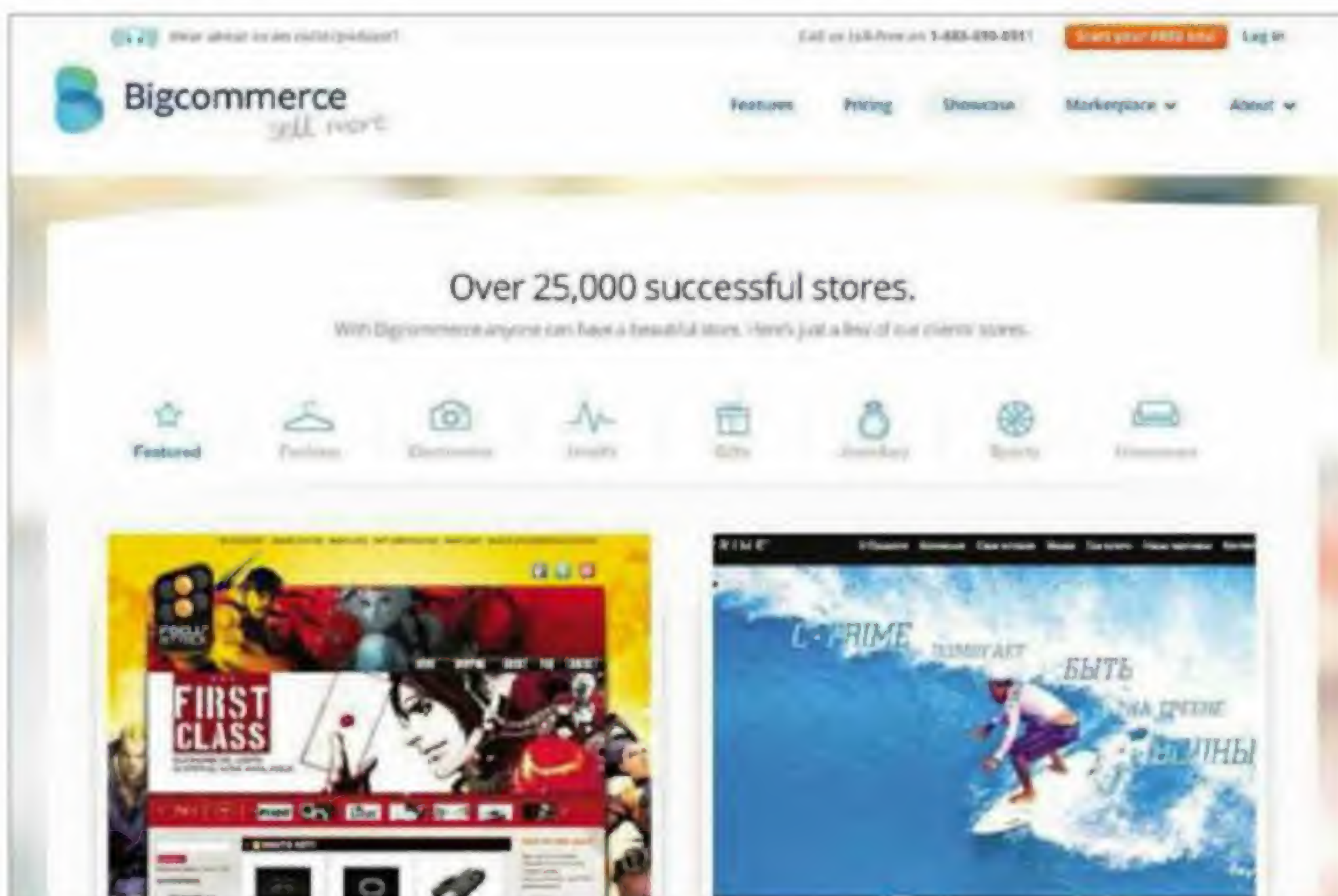
Virtual private servers (VPSes) sit between shared and dedicated hosting. They offer all the functionality of a dedicated server for a fraction of the price; indeed, what you get appears, in every detail, to be a dedicated server. In reality, a single computer is running several “virtual servers”.

Each copy of the server software thinks it's running on its own computer, but the machine's processor is actually handling them all at the same time, while each has its own hard disk partition. Since the physical resources of the server are shared between the virtual servers, you can expect less hard disk space, lower memory, and competition for processor time.

However, VPSes are an excellent halfway house between shared hosting and dedicated servers. For around £30 per month, you get most of the benefits of dedicated hosting for a price closer to business-class shared hosting.

### Operating systems

Once you've decided which type of hosting to plump for, your next task is choosing the operating system on which your web server should run. Linux has long been the dominant web server OS; it's lightweight, reliable, free and, crucially, the native environment of many of the web's core technologies, including PHP and MySQL. You can get Windows versions of these, but it's better to run them under their intended operating system. (Incidentally, while



Specialist e-commerce server hosts, such as Bigcommerce, offer easy payment integration



Apple's OS X accounts for a respectable minority of desktops, it isn't widely used for commercial web hosting – Mac fans tend to pick Linux.)

We recommend you begin with the assumption your web server will run Linux. You should consider a Windows operating system only if there's a compelling reason to do so. For example, if a web application requires Microsoft's .NET Framework to run, Windows is the only choice.

With both Windows and Linux, you're shielded from the complexities of the OS by browser-based control panels, which allow you to handle most tasks through a clear, icon-based interface. In the case of both virtual and dedicated Linux servers, you can use the cPanel and WebHost Manager package (*see cPanel and WHM*) to handle all aspects of server management; you don't need to worry about learning obscure terminal commands.

If you intend to create a website to sell products or publicise your business, a Linux-based hosting product is almost always going to be appropriate; indeed, the majority of shared hosting plans feature Linux.

## Space and bandwidth

Hosting packages include a predefined amount of hard disk space: the more expensive the package, the more space you'll receive. The majority of websites require very little, so don't imagine that you'll need to pay for the kind of levels on your desktop PC. Most sites will easily fit into a few hundred megabytes, so disk space isn't likely to be a deciding factor in choosing a host. Treat "unlimited space" offers with the disdain they deserve.

Hosting packages usually specify a maximum bandwidth. This is the total amount of traffic your site is allowed to handle before excess charges apply. If you have a web page that contains 80KB of data, for example, each time one person views that page they're using 80KB of your allowance. As with hard disk size, you may be surprised by how little you need. As a very rough rule of thumb, you'll typically be allowed ten times your hard disk space in bandwidth per month. Again, in practice, the bandwidth allowance is likely to be so high that it's irrelevant when it comes to selecting a host.

## Technology

As a bare minimum, your shared hosting package should include PHP 5, the programming language that adds dynamic functionality to web pages, and MySQL 5, the most commonly used database, with permission to create one database. You might not know if you'll need these technologies, but they cost nothing, offer the possibility of adding functionality to your site without changing packages and, crucially, are required if you want to install WordPress and many other web applications that can make creating your site easier.

You also need a control panel to configure your web space. Most shared hosting firms have their own website management software; if this is the case, check whether they include automated scripts that make the process of setting up services such as WordPress as simple as clicking a button.

Most virtual hosts offer cPanel; in this case, make sure the package includes Installatron (<http://installatron.com>) or Fantastico (<https://netenberg.com/fantastico.php>) to gain the benefit of one-click software installation.

## cPanel and WHM

Produced by the same company, cPanel and WHM (WebHost Manager) together provide a graphical interface allowing website owners to manage their virtual or dedicated servers and sites.

WHM handles the lower-level tasks of organising the server. For example, you'd use WHM to set up users and grant them access, and to configure anything that applies across the entire server. You can use it to reboot the server, set up backups, monitor the health of the system, and create website packages.

When you set up a server (which, in the case of a VPS, takes a matter of minutes), you log into WHM with the root password assigned by your provider. The server is now yours to command and, while you won't need to learn any Linux terminal commands, you must take care.

You'll probably hire a server with a specific site in mind, but, since each machine can handle multiple websites, you'll need to set up a package first. To do this, begin by scrolling down the list of functions on the left of the WHM control panel until you reach the Packages submenu. Then click "Add a package" and give it a name. If you're using the server for your own purposes, you can leave each of the settings on "unlimited", but if you're hosting sites for others (for example, if you're setting up a business as a reseller), you'll need to think about

how to structure your packages to suit your sites.

To get your first site up and running, select the Account Functions submenu and click "Create a new account", then pick one of the packages, supply domain details and create a user account for the site. Finally, you'll need to set up the DNS records for the site (each host will handle this differently), then head off to your domain registrar and alter the name servers to point to your new machine.

Once the DNS records have fully propagated across the internet, you'll be able to log into your website using "www.yourdomainname.co.uk/cpanel" and the user details you created in WHM. You'll see the cPanel dashboard, which is where you'll now concentrate your efforts.

The dashboard includes links to a number of video tutorials that will help you learn the basics. In cPanel, you can set up the email accounts for the domain, as well as additional FTP users and MySQL databases (which is crucial for many web applications). You'll then be able to use these to upload your files to the server.



If you plan to create multiple websites based on a content management system such as WordPress, ask your host to include Fantastico or a similar installer plugin when you sign up for your server. That way, much of the work involved in publishing a site will be done for you.

The main challenge with cPanel and, especially, WHM, is the sheer range of options offered. If you plan to host only your own sites, you can be up and running once you understand the basics. If you intend to host multiple websites, however, especially as a reseller, expect to spend some considerable time learning about server management before going live.



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For dedicated servers, cPanel is joined by Plesk. You receive far greater functionality, allowing for the ability to make low-level changes to your system configuration. Just remember the adage: with great power comes great responsibility.

## Service-level agreements

For dedicated hosting or VPS, you should only consider providers that offer a guaranteed “service level”. The most important component of this is the percentage of time over any particular month that you can expect your server to be working. While 99% might sound excellent, bear in mind that a 1% downtime is more than seven hours per month. You should be looking for at least 99.9% guaranteed uptime for a dedicated or virtual private server.

With shared hosting, you’re much less likely to find a quoted figure. I suggest contacting the host’s helpdesk and asking if they have a guaranteed uptime, or if they can tell you what their uptime has been in,

say, the past year. You can’t expect such a high level with shared hosting, since you’re paying much less.

## Contract length

There’s no reason to sign up for more than a month-by-month commitment if you’re intending to use shared hosting or a VPS. Avoid any host that doesn’t offer the option of a monthly contract. With dedicated servers, it’s more common to have an initial commitment of 12 months, followed by an agreement to give one month’s notice of termination. Be wary of signing up for longer to get a bigger discount – you don’t yet know if this host is going to suit you.

Before you select a shared hosting package, make sure it includes enough email addresses. To have any credibility, you need to be able to send and receive emails from an address that includes your domain name. The days of being able to get away with an AOL or Gmail address are long gone.

## Making the decision

The best way to choose a host is through experience – either your own or that of people you respect.

Although we don’t review web hosts or their individual packages, the *PC Pro* Excellence Awards bring together the experience of thousands of readers. All the major web hosts are rated for speed, reliability and the quality of their technical support, and our interactive results tables allow you to sort vendors by the criteria that are most important to your business. You’ll find full scores for the most recent Web Host award at [www.pcpro.co.uk/links/225webhost](http://www.pcpro.co.uk/links/225webhost).

If you take the VPS or dedicated hosting route, we recommend you make sure that cPanel (see *cPanel and WHM*, p70) or Plesk is included in the price. Not only does this enable you to manage every aspect of your web space without having to resort to Linux commands, it’s also a sign of high-quality shared hosting from a provider that has thought about how the space will be used.

## What’s the most important factor when choosing a web host?

“Reputation. With most web hosts already offering 99% or greater uptime, unlimited resources and knowledgeable support, the key to choosing a successful web host is evaluating their reputation. Seek out magazine reviews and find out what customers are saying about them. Have they won awards? Are they easy to contact for support? Would their customers recommend them? Do they offer short-term or no contracts? Do they offer open cloud standards to avoid vendor lock-in? All of these reveal a credible web host.”

**KATE CRAIG-WOOD, MANAGING DIRECTOR, MEMSET**



“There’s nothing more important than UK-based support. Regardless of how much or how little hosting knowledge you have, when you need a question answered or an issue fixed, you want to speak to a real person in the UK via phone or email. Most hosting companies offer good value and reliable products; the real value is in fast, expert support made in Britain.”

**SALLY TOMKOTOWICZ, CUSTOMER ACQUISITION MARKETING MANAGER, NAMES.CO.UK**

“Support, hands down. Krystal has more than 99.9% uptime, but servers will go wrong at some point. What you want is a host that’s technically competent, not one that just wins business through sales-speak. Look for clues that show the company’s priorities. Do they have a phone number for support, not just sales? How good is their support site? Are they honest about issues past and present? Finally, test support before you buy.”

**SIMON BLACKLER, FOUNDING PARTNER, KRYSTAL HOSTING**

“The most important factor is trust. Can you trust that web host with your website? Trust comes from access to fast and accurate support, 24 hours a day; your website always being accessible; high levels of server security; having access to the latest technology; and getting value for money. Your choice of web host has a huge impact on the performance of your website, so you have to be able to trust they will deliver.”

**JONATHAN BREALEY, DIRECTOR, HEART INTERNET**

“Reliability. When choosing a web host, you want your service to consistently perform according to its specifications. Whatever your activity, you don’t want your website to be frequently down, or slow, and risk losing visitors, wherever they are or whatever time of day or night it is. A reliable web host provides high uptime, network performance and fast technical support responsiveness, which will guarantee the online availability of the web page.”

**ANNE-SOPHIE MONNIER, UK BRANCH MANAGER, OVH**



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## CAREERS

# So you want to be an... IT trainer

Want to help other people improve their IT skills and technical knowledge? **Stuart Andrews** explains how to become an IT trainer

**T**he applications and technologies used in business IT are complex. Even the most intuitive might take years to fully understand and master, while the most powerful tools and features often lie undisturbed somewhere in the menus. Small businesses and larger enterprises alike will invest in new IT solutions, but often need help to build confidence and basic skills in their workforce. This is where IT trainers come to the fore. They enable administrators, managers and end users to make the most of their applications and services, so they can do their jobs more effectively.

IT trainers work in a number of situations. Some are employed by software companies to provide training to clients, while others work in-house for corporations, training their internal userbase. Many are employed by consultancies, or by companies that specialise in training, seminars or working on-site with clients. Even more work in classroom or workshop environments, or online, where remote access and real-time communications enable virtual classrooms. Some trainers do all of the above.

## Knowledge and experience

In short, it's a role that covers a lot of ground, particularly when you consider the huge range of courses and technologies on offer. After all, while Word and Excel are extremely popular, somebody also has to train companies working in Oracle, SQL Server or 3ds Max.

## "Knowing how to handle different personalities is the key to long-term satisfaction"

As a result, there isn't any one set of qualifications or experience for an IT trainer. "It's slightly horses for courses," says Ben Richardson of Acuity Training, a Guildford-based provider. "What might be professionally relevant for an Office trainer may be less relevant for a technical trainer, and what's



required to teach an introductory-level Excel course is very different from what's required to teach an advanced SQL Server course."

A strong working knowledge of the products involved is essential. "The key is to learn the product very well and be comfortable to stand up and explain it to people," says Richardson. If that knowledge has been acquired from on-the-job experience, all the better. "If you want to be an AutoCAD or a Photoshop trainer, it's great if you have some industry experience... because there's

nothing that brings training to life more than speaking to people about problems you've had," Richardson adds.

Jeff Barnes, executive director of training at national training provider

QA, says achieving a balance between technical knowledge and training skills is critical. "You've got people who are very good technologists [but] can't turn that into education, because they haven't got that interpersonal style," he says. "On the other side, you have people who are very good

trainers, but don't necessarily have the depth of knowledge to teach quite technical subjects."

QA takes people from both paths and helps them develop into effective IT trainers, but without technical aptitude or the right attitude, it can be an uphill struggle. "I've seen people move from teaching end-user, desktop-style applications – Word, Excel and the equivalent – into teaching more technology-based subjects, such as infrastructure, networking and web development, and they've been very good," he notes. "If they have confidence in the subject, the training skills come out on top."

## Technical qualifications

Industry experience might not always be necessary, but technical qualifications usually are. While it's theoretically possible to train users in Microsoft, Cisco, VMware or Adobe products without professional certification, it makes good business sense to have official accreditation. "Usually an instructor should have a qualification relevant to the vendor software they train on," says Paul Knab, training manager at Nexus Open Systems. "For example, a Microsoft technical course



For less product-specific courses, there might not be any mandatory certification, but certain qualifications might be advantageous. Industry body the Learning and Performance Institute has its own trainer assessment and accreditation programmes, while CompTIA has a Certified Technical Trainer (CTT+) certification for classroom and online training. “We would always want our people to go through a process of becoming a qualified trainer,” says QA’s Barnes, although Richardson takes a slightly different stance. “We like our trainers to have it, but we don’t put quite the same emphasis that we do on them having the technical know-how, because we know it’s about people’s presentation skills and confidence. We’ll take a rounded view.”

## Personal qualities

In the classroom, a little star quality doesn't go amiss. "Sometimes we describe being a trainer as similar to being an actor, where you assume a persona," says Barnes. Nexus' Knab agrees. "One of the most challenging things is constantly being on top form, week in and week out," he says. "Effectively, you're



## A day in the life of an IT trainer

**Name:** ~~XXXXXXXXXXXX~~ David Walker

**Job title:** ~~Principal technologist~~ **Principal technologist, QA**

**Experience:** ~~Ten years~~ x x x x x x x x x x x x x x x x  
consultancy oooooooooooooo x x x x x x x x x x x x x x x x x x

What started today is having go home people the training pad of the system is 300 for the 1200 pm. Top up as list of fine system this at drive been brought in stand, rule any digital most and expense tied. After that daily depth of technical websites have been scheduled a plan, a daily menu guided by her blend of a time block to fix for system three months in but what is group possibly they will make a

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# PROFILE

"Chaitin's theorem states that there exists no algorithm which can compute the probability of a program halting." "Pull out the specific details from the statement."

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[illegible]

performing, and must always convey your enthusiasm and a positive approach, even if delivering a similar subject for several weeks.”

## Challenges and rewards

QA's Barnes adds more detail. "Occasionally you get a challenging delegate who wants to test your knowledge – and maybe your patience," he says. "Usually they want to provide a little one-upmanship, particularly in the classroom, where they want to emphasise their own personal experience and skills."

However, a good trainer can turn the situation to their advantage, he argues. “As long as you’re patient and allow them to work with you in the classroom – use them rather than fight against them – that can be managed.”

While trainers typically earn from £20,000 to £45,000, with £35,000 the average salary, it's the people who provide the ultimate reward. "You get some immediate and usually very nice feedback," says Barnes. "At the end of a course, or the end of a particular day, if somebody comes up to you and tells you they really enjoyed the course and learned something, and that it's actually going to help them in the workplace, that isn't something you typically get everyday in your working life."

Richardson agrees. “A lot of our trainers love what they do. They’ve found something they enjoy and that they’re good at. Watching delegates walk out, having learned and feeling much more confident, and seeing that they’ve made a difference to that person’s day-to-day work life – that’s a really rewarding thing.”



## ADVANCED WINDOWS &amp; MAC

# Mixing it up with Windows 8 add-ons

**Jon Honeyball** welcomes another transformative tool for Windows 8, and comes very close to smashing a Wi-Fi camera to pieces



**I**t never rains but it pours. In my last column, I described the rather excellent Start8 tool from Stardock – which allows you to put the Start menu back into the desktop version of Windows 8 – and explained how it brings back all the features we know and love from Windows 7, thus transforming desktop Windows 8 from an awkward, clunky nightmare into something that's almost a delight to use. So, what appeared immediately after I wrote that? Yes, another tool from Stardock, called ModernMix.

ModernMix enables you to run Modern (aka Metro, aka Windows Store) apps in their own windows on the Windows desktop. You don't need to go back to the full-screen view, or the docked view, to use them – you can run them on your desktop like any other app. On my large-screen Dell desktop computer, this utility has made Modern apps useful again; I can contain them at a sensible size, so they don't take over the whole 27in desktop.

**"Blue should be a shot in the arm for Windows 8, but it's likely to be more of the same"**

ModernMix is a little flaky at the moment – it's still in beta, and it's trying to squeeze one UI into the desktop of another. However, I've found it reliable, useful and easy to use. In my opinion, the installation of ModernMix and Start8 – once they're both properly finished – will be compulsory on all future Windows 8



**ModernMix and Start8 restore Windows 7 functionality to the desktop version of Windows 8**

desktops and Ultrabooks/laptops. It's a different story for touch-based tablets, however, where the Modern app size is more appropriate, and desktop apps look a mess (the fingertip control doesn't work on a quasi-pen-based interface). However, it's a no-brainer on a desktop.

Rumours are starting to circulate among the more excitable bloggers about the future version of Windows 8 and Windows Phone 8 codenamed Blue.

So far, there's little to suggest Microsoft has listened to the complaints of desktop users and built Start8- and ModernMix-style functionality into the OS. To be honest, I doubt it will do so any time soon – Microsoft is fixated on a vision of desktop computing that's touch-based and full-screen. The fact you might own a

bunch of legacy applications appears to be of little concern; just look at the way the company strives to control the web-browser experience, much to the detriment of many line-of-business applications. Blue should be a shot in the arm for Windows 8, but I fear it's likely to be more of the same design mandate.

## Camera configuration

A month or so ago, I was bemoaning the shocking state of many professional security software packages. I'm not talking about antivirus software (which is bad enough in its own right), but rather the software tools that run electric door locks, access control systems, alarm systems and so on. After a disgruntling year, we recently threw out our existing system – which was archaic and unpleasant to use in the real world – and opted for an alternative provider.



Last week, I decided to put a Wi-Fi-connected webcam into my garage at home, for a rather convoluted reason. For insurance purposes, I have to have a system called Tracker fitted to one car, to ensure its location can be tracked in case of theft. This system allows me to log into a website and see where the car is located. It also generates email alerts if the car is moved without the ignition being switched on. Anyway, I arrived in the office one morning to find an email telling me the car had been doing 9mph through my village at midnight the previous evening.

I hadn't actually seen the car that morning, since it should have been locked up in the garage, so I had to drive the ten miles home to see if it was really in there. Hence the desire for a cheap, Wi-Fi-connected webcam that I can call up to save me the drive in future.

A quick search located the D-Link DCS-932L "Day/Night Cloud Camera". It has Wi-Fi for connecting to a network, and also an Ethernet port if network cabling is nearby. It works in night mode by using infrared LEDs, and all it needs is a mains socket for power. The video works at up to 640 x 480 pixels, which, while pretty low-res, is more than good enough for checking if the car's there or not. Since it's a product currently listed on the D-Link website, what could possibly go wrong?

On initial inspection, the product looked sufficient. It's a small camera that can be wall-mounted, with a reasonable-length cable to its wall-wart PSU. It even comes with an Ethernet cable to enable initial setup before the Wi-Fi has been configured. I went to the website and downloaded the latest Windows setup program, which ran and located the camera on the network. It then tried to open a web browser to continue the setup.

Unfortunately, this required an OCX browser add-on to be enabled, but, since I

## "Installing the D-Link camera was turning into a rather sad experience"

was using Windows 8 with IE10, the default security lockdown stopped this process dead in its tracks, and no amount of fiddling with the IE10 security settings would get the OCX to load and run. After five minutes of this nonsense, I decided I wasn't in the mood to compromise my Windows 8 system's security any further and decided to try the Mac OS X setup instead. After all, this couldn't involve OCXs, since they're a decidedly Windows abomination. Maybe D-Link had managed to do a better job here?

I downloaded the installer, and once again the front-end setup program located the camera and allowed for some initial setup settings to be applied. It then tried to launch a web browser



● D-Link's DCS-932L camera, which I bought to monitor my car, proved very irritating to set up

for more detailed configuration. This time, it decided it needed a full Java installation in order for video to be viewable. My laptop didn't have Java installed – I'd decided to uninstall it as a security measure after the recent spate of exploits – so I started to reinstall it. I was trying to do so using Chrome, just because that's where I happened to be at the time, but the 64-bit Java download and installation package wouldn't play ball with my 32-bit Chrome installation.

At this point, I should have given in, repacked the camera and sent it back to the supplier on the grounds it isn't fit for purpose (in fact, anything that can make initial installation so difficult deserves to be thrown against a wall). However, I decided to persevere, since the initial setup applet had told me the IP address of the camera. I opened up a web browser, went to the IP address, and, not too surprisingly, there was a built-in configuration web server within the camera that I could access via a standard browser.

You'd think they couldn't make this any harder, but my sense of humour really started to fail when I discovered the configuration area for Wi-Fi used the phrase "pre-shared key" to

refer to its Wi-Fi password. I know PSK is the correct technical term, but surely most users would better understand "password"?

Many of the more advanced functions, such as motion detection, wouldn't work without Java, but I was able to set up mail and FTP, and specify video and audio settings. Still, it was turning into a rather sad experience.

Getting to the picture stream from outside the house required some juggling, of course. I could connect via HTTP through my ADSL router to the IP address of the camera, but that would require opening up the port and forwarding to the address of the router. I'm not naive enough to believe NAT plus a basic firewall is enough to keep out a determined attacker, but I still prefer not to punch holes in my firewall unless it's really necessary.

Fortunately, there's a free cloud service called mydlink ([www.mydlink.com](http://www.mydlink.com)) that allows you to create your own account and add your home cameras. These transmit to the cloud service, and you can connect to that to watch the video streams. There are free apps for iOS and Android, too.

Of course, the problem with a free web service is just that – since it's free, it might shut down at any time. That said, I could use the basic FTP or email services to take a snapshot of the garage, and use inbox rules to filter the emails into an appropriate subdirectory.



Nevertheless, it's left a bad taste in my mouth. It's quite clear to me that this product range has been left to rot. Its setup procedure is frankly unacceptable, and you have to jump through hoops to work around various nasty design decisions.

Why is this still happening? Why are major manufacturers such as D-Link allowing products to rot slowly with little or no ongoing support? I've contacted D-Link's support, and will report back with what it has to say. I like the product – it does what I need – but this sort of configuration nonsense isn't acceptable.

## Excel issues

Readers with long memories may remember me dissecting various problems with Excel's calculation methods over the years (indeed, this discussion in these hallowed pages stretches back well over a decade). One of the leading investigators into Excel's maths incapacities is Bruce McCullough, now professor of decision sciences at Drexel University, Philadelphia. I can't begin to understand the statistical tests he and his team employ, because I'm neither a statistician nor a mathematician, and I'll confess I gave up at university at the point where I had to learn Laplace transforms. Nevertheless, I've communicated with Professor McCullough over the years, and I have faith he knows what he's talking about.

His latest paper ([www.pcpro.co.uk/links/225aw1](http://www.pcpro.co.uk/links/225aw1)), "Spreadsheets in the Cloud – Not Ready Yet", goes into detail about some significant problems with various cloud-based spreadsheet packages, and compares them, where applicable, to their local-machine equivalents. The paper reveals there can be important differences in the calculations performed by desktop Excel and the Excel Web App you'll find in Microsoft's hosted services.

The most significant problem is that there are differences in the answers, which should

cloud-based spreadsheets have not been performing basic quality control and providing sufficient documentation, and that the results of their statistical calculations cannot be trusted. Whether the user can expect the developers to correct these problems is a legitimate concern. Zoho and Google have no track record when it comes to fixing errors in spreadsheets, but the errors they have made demonstrate a complete lack of knowledge concerning the literature on the accuracy of statistical software, in particular spreadsheets. Microsoft has a long track record of failing to fix errors in the PC version of Excel, including Excel 2010 (Knüsel 2011; Mélard 2011). Whether Microsoft can fix errors in its cloud spreadsheet without having fixed errors in its PC spreadsheet we are doubtful. We leave it to the reader to decide whether other calculations performed by cloud-based spreadsheets can be trusted."

Please read that several times, slowly, then ask yourself how much you're prepared to trust a cloud provider of spreadsheet services. Should it really be this difficult? You might argue that only some esoteric stats functions are affected here, and that may be so, but there's nothing to suggest it doesn't apply to other functions, too. In any case, how would you know? Unlike a desktop app, you can't roll back to a previous version and double-check. Are you feeling lucky?

## Apple Configurator

Do you need to deploy a bunch of iOS devices to staff? Have you given up on Bring Your Own Device? Do you want to give them the hardware, but ensure your line-of-business apps are on there, that updates are installed, and that you can control the devices properly? Take a look at Apple Configurator, a free download from the Apple Store.

This tool lets you apply a whole range of configuration policies to mobile devices. You can decide to have a light touch – for example, you can impose mandatory updates, but allow users to choose their own apps and content from the App Store – or you can implement a more severe lockdown, which might be more appropriate for a kiosk environment or a classroom.

There are three main areas to this app: Prepare Devices lets you manage the OS, updates, apps and licensing; Supervise Devices



Mobile policies can be applied using Apple Configurator

gives you control over groups of devices that share common apps, settings and profiles; and Assign Devices allows you to create and manage users and groups, assign a supervised device to each user, back up and restore their content and settings, and distribute and retrieve their documents.

At first glance, the app looks very simple to use, but there's a lot of depth to it. For example, you can import user and group information from an Open Directory server, and you can buy collections of application licences directly from Apple, then apply these to the machines. You can control how machines are reset, wiped and reconfigured, and you can apply a host of settings that a managed device needs in a business or educational context.

In a business context, you might want to create a set of policies that define Exchange ActiveSync, VPN tunnelling and the Wi-Fi connection to the corporate network, and lock down the installation or removal of apps. You might want to pre-cook the installation of a bunch of line-of-business apps, some of which are internal to your organisation. All that's required to force these policies onto each device is for the device to be connected via USB, which can either be done individually, or via a charging cart or setup station.

There's a great deal of power in Apple Configurator, and, if you're responsible for a number of iOS devices, I strongly suggest you take a look at it.

## "Microsoft has a long track record of failing to fix errors in the PC version of Excel"

be enough to make most people go cold at the thought. Since there's no version control on the cloud-based service, you have absolutely no idea whether the maths that calculated your result today is even the same as the maths it used a month ago; it's possible for a hosted web application to come up with different numbers each time. Of course, the same might be true of the exact page layout in a word-processing app, but a page-formatting bug is far less likely to prove mission-critical.

I'd like to quote the final paragraph of the report: "Based on the findings, it is our understanding that the developers of



## MOBILE &amp; WIRELESS

# A phone for the real world

**Paul Ockenden** works with the readers of his column to come up with the perfect real-world smartphone, and looks into a Facebook scam



**PAUL OCKENDEN**

Owner of one of the UK's oldest web agencies, Paul works on award-winning sites for many blue-chip clients. Twitter: @PaulOckenden

**L**et's start this month's column with a thought experiment. Regular readers will know my views on the direction that smartphone design is currently headed, and from my mailbox I know that plenty of you agree with me. Every time I see a review for a flagship mobile phone, a little part of me dies inside. It's as though customer need is being ignored and the whole industry has become a "specs" contest to see which company can beat down its competitors in the numbers game. Tech Top Trumps, or to be less polite, a schoolboy game of seeing how high they can pee up a wall.

A year ago, our mobiles were already fast enough to perform all the normal phone tasks, as well as fetching email, web browsing and running apps. They ran games very well, too. Yet this year our phones are four or five times faster. Why? A year ago nobody complained that their mobile's screen was hard to read, yet this year's screens sport four or five times as many pixels. Why?

Okay, so here's my thought experiment. Let's try to assemble the specification for the

**"We once thought a 5in screen marked the smaller end of the tablet sector"**

ideal smartphone. You never know, if any manufacturers read this perhaps they'll even build it. The next Nexus? Somehow I doubt it. Let's start with screen size, one of the areas that



suffers the most inflation. We once thought a 5in screen marked the smaller end of the tablet sector (remember the Dell Streak?), but now five inches seems the target size for high-end phones. I expect they'd go for six inches if they weren't afraid of all the rude jokes.

I have several problems with these huge phones. They won't fit comfortably in my pocket; in my jeans, they poke me in uncomfortable places when I sit down; and in my shirt, they poke me in the ribs whenever I twist – say, to get into the car. Worse than this physical discomfort is the fact I can no longer use them

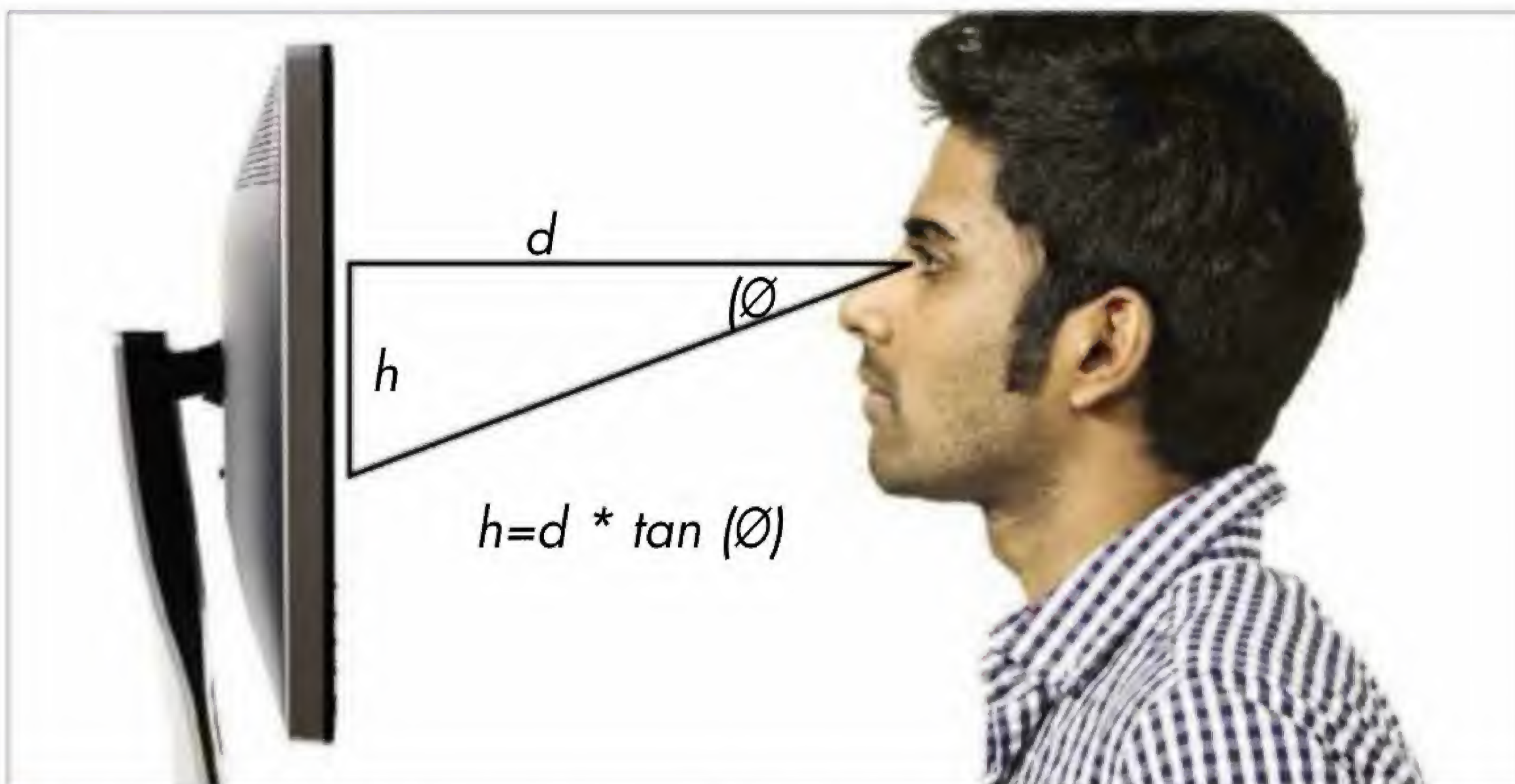
single-handed: their keyboards are too wide to hold the phone in my right hand and reach across the touchscreen with my thumb. It must be worse still for people – predominantly

women and children – who have smaller hands. For me the screen-size sweet spot is around 4.2in or 4.3in, which also seems to be favoured by the 50% of you who mailed me after my previous monster-phone complaints here. (Around 20% of you like huge phones, while the remaining 30% don't care.)

Even once we choose 4.3in as our screen size, there's still the size of the phone surrounding that screen to consider: some have wide bezels, while others run the screen all the way to the edge. I really don't see the point of lugging around a phone that's any bigger than it needs to be, so the first couple of specs for our ideal smartphone will be a 4.3in screen that goes right to the edge of the device.

Now what about its pixel density? This seems to be the parameter most driven by competitive marketing over user need – Phone A has pixels so small that you can't see them, so Phone B introduces even smaller ones. What's





Simple maths finds the maximum perceptible pixel density for a given viewing distance

the point? Rather than get bogged down in marketing nonsense, let's tackle this pixel-density issue using good, old-fashioned maths.

If you have 20/20 vision, you should be able to resolve parts of an image that subtend one minute or 0.0167 degree of arc at your eye's retina. So for a viewing distance  $D$ , the minimum spacing between two visibly distinct pixels needs to be  $D \tan(0.0167)$ . Here's where we need a bit of guesswork – what's the average viewing distance for a phone? I'd reckon around 35cm. At that distance we're looking at a resolving power of 0.1mm, which means your eye can separate

doubt the company would build our phone for us. This leaves us with Android – and why not? In its Ice Cream Sandwich and Jelly Bean incarnations, Android has become a competent, stable and mature mobile operating system.

Okay, let's add Jelly Bean to our specs list, but we'll go further and specify that this version of Android should have minimal tinkering applied – no Samsung TouchWiz or HTC Sense, just the stock Android user interface, which is lovely and clean, and to which you can easily add widgets if you want any extra frippery.

What else is important? Battery life, of course. In fact, for many people this is the single

most important aspect of a phone: heavy mobile users don't want their phone running out of juice during the working day, while more moderate users would

like to eke out two or maybe even three days between trips to their charger. *PC Pro*'s Reviews team employs its own battery-rundown test suite that simulates light usage over 24 hours by making calls, downloading files and checking email. They then check how much juice is left, albeit with the limitation that they have to accept the phone's report of its own remaining percentage, so it could quite easily cheat. It's still a valid comparative metric if applied to all phones, though, so let's say that we're looking for a phone that has around 75% battery life left in the *PC Pro* battery test.

Are we interested in CPU speed? Not really, other than to stipulate that the phone shouldn't show any noticeable sluggishness or lag. Unlike what you'll read in typical magazine phone reviews, we Real Worlders aren't that impressed by class-leading Quadrant or SunSpider scores. It isn't that we want slow phones – far from it; more that it's silly to make a handset run any faster (and thus be more power-sapping) than it needs to. In fact, stripping out unnecessary CPU oomph and excess pixels is what should give our phone the extended battery life we require.

What else? Obviously it should have a decent camera with effective autofocus, and most importantly it should fire up quickly. It needs an SD card slot, and one that can take 64GB cards (too many max out at 32GB). A removable battery would be nice, but it isn't on our essentials list given the battery life we're aiming for; removable batteries add a few millimetres to the thickness of a phone, since the battery itself needs a case and a removable door mechanism on the back. Build quality will be critical – I'm forever getting emails asking about rugged phones – so we want our phone to be sturdy, not a flimsy little plastic unit that will start to shake apart if it rings too loudly. Ideally we'd want a Gorilla Glass screen, with the rest of the phone body in metal or some equally tough industrial-grade material.

I think we're pretty well there now, specs-wise. This is going to be a brilliant phone, if only we can persuade a manufacturer to build it. Oh, hang on a minute, they already have! Take a look at Motorola's Razr i, which Mike Jennings reviewed in *PC Pro* last year (web ID: 377155). It's a brilliant phone that I've been using as my primary phone for a couple of months. As always, I have my big toy box full of the latest phones here, so I could choose to use any of them, but the Razr i has been winning out over everything else recently.

## "For many people battery life is the single most important aspect of a phone"

no more than roughly 250 pixels per inch. Since we've selected a 4.3in unit, the closest typical screen resolution that offers the required density is 960 x 540 (which works out at 256 pixels per inch), so let's use this as the screen specification for our phone.

The next most important spec is probably the operating system. In an ideal world, we'd see manufacturers producing vanilla hardware onto which you could load whichever mobile OS you wanted to – regrettably, that isn't going to happen anytime soon. Although there are people who've made iPhones run Android or vice versa, this tends to require a degree in extreme hacking. So what are our choices? We obviously can't use iOS, since Apple would never stoop so low as to build a phone that its customers actually need. Windows Phone 8 is a possibility, although it comes with fairly draconian hardware support rules – for example, it doesn't support our 960 x 540 screen resolution. There's BlackBerry 10 OS, which is getting some good reviews, but as with Apple's iOS, it's only available on the company's own handsets, and I somehow



With its edge-to-edge display, the Motorola Razr i makes great use of the available space



What I like most about the Razr i are its perfect form factor, its “built-like-a-brick” construction and incredible battery life. In Mike’s original review he criticised the device for only running Ice Cream Sandwich, but it’s since received an update to Jelly Bean. One of this phone’s additional benefits is that it employs a P2i liquid-repellent nano-coating technology (which Motorola brands as “SplashGuard”), applied both to the outside of the case and to the components inside it, which means you shouldn’t cause any damage if you spill liquids over your phone or use it in heavy rain (how many people realise they can ruin their mobile simply by trying to use it during a storm?). I’ve confirmed empirically that it’s both coffee- and chocolate-milkshake-proof...

Are there any downsides to the Razr i, our apparently perfect phone? I’ve found one – since it employs an Intel chipset, rather than the usual ARM silicon that powers most Android phones, a small number of apps won’t work on it. I say “small” because the number is very tiny indeed, but unfortunately that tiny number includes the popular TomTom and BBC iPlayer apps. I can live without TomTom, as the Google Maps Navigation app that comes free with Android works well, often providing better routes than TomTom. I do miss having iPlayer on my phone, though. I hope the BBC fixes this limitation quickly: it isn’t as if it doesn’t have the capability to do so, because the BBC News app streams live video of the BBC News Channel perfectly well.

Price-wise, you can pick up a new Razr i for around £245 exc VAT by shopping around. If you’re the kind of person who likes to show off that you have the latest and greatest smartphone, then it probably isn’t for you, and if you insist on a phone that always gets five-star reviews and comes out top in group tests, then again, this isn’t the phone for you. However, if you want a phone that reflects what people actually ask for rather than what marketing and PR people tell them that they want, the Razr i might just be the perfect choice. Plus, as an added bonus, if you were to get involved in a “how high can you pee up the wall” contest, yours will be the only phone with a SplashGuard coating...

### Name a day with a D in it

I’m now going to stray slightly into Davey Winder’s territory, because this is a topic that RWC editor Dick Pountain asked me to explain here after I’d explained it to him. Those of you who use Facebook will no doubt have recently seen your friends and family posting all kinds of stupid and apparently pointless puzzles. Quite often they’ll be silly

competitions such as “Name a band that doesn’t have an A in its name – it’s harder than you think” (of course it isn’t hard, since there are millions of bands without the letter A in their name). Or rather than a question, you may see a photo with instructions such as “Click on the photo, post a comment, see what happens”. Of course, nothing happens. Yet another variation involves liking a page and sharing a photo, with the promise that you might win something valuable. Quite often it will be a photo of iPhones or iPads, but I’ve also seen a trend towards expensive shoes and handbags. Sometimes, the name of the account running the competition will be something that looks quite genuine too.

I’m sure most people probably suspect that it might be some sort of scam, but think “What the heck, it isn’t doing any harm, and there’s always a slight chance I might actually win”. Dick was entirely convinced they’re a scam, but couldn’t work out how they got a pay-off, and that’s what I explained for him. Actually, they are doing some harm: for starters, they get you to share this rubbish with your friends, which is likely to lure them into doing the same – but mainly they help along the scammers’ business model.

The business model behind these quasi-competitions is that they’re trying to get as many likes or comments as possible, and that’s all. No prizes. You’re never going to win an iPhone or a pair of Ugg boots, or see that picture change. They just generate plenty of activity, often collecting hundreds of thousands of comments and likes. Facebook employs an algorithm called “EdgeRank” for its newsfeed optimisation: working a bit like Google’s PageRank, it prioritises how often things will appear in peoples’ Facebook feeds. Pages with lots of likes and comments will get a much higher EdgeRank placing, which is why so much of this guff shows up in your newsfeed.

But where’s the beef? Well, a page with hundreds of thousands of likes is a very valuable commodity. Many brands, both large and small, are starting to venture into social media, and the first thing they learn is that it can take months or even years to build up an online community. As a result, many are prepared to buy a pre-built community from a scammer (although, of course, being novices they’re probably unaware of the scam element involved).

Someone who wants a quick win – it might even be another scammer – buys the page and instantly has a huge following with lots of likes and comments, and a long-established EdgeRank capable of pushing out updates to hundreds of thousands of users. It’s a marketing manager’s dream!

**Listen to granny**  
She may not be on Facebook, but your gran’s old adage “if it looks too good to be true, it probably is” is as true today as it has ever been, and it’s especially important in the social media world.



Many otherwise-intelligent people have been falling for scam Facebook competitions

To be fair, Facebook has tried to tighten up in this area slightly: until fairly recently, the scammers could change the name of the page when they sold it to reflect its new owner, but a while back Facebook changed the rules so that you can’t change the name of a page after it has received more than 200 likes. Even so, the scammers get around this restriction by giving their “puzzle” a fairly official-looking name in the first place.

I must admit that I too become irritated seeing friends and family taking part in these scams, especially those who really ought to know better – I even found a friend with a senior position in IT security sharing a “Win an iPad” photo. But until someone has explained to them how the scam works (as I’m now doing), it’s difficult to see what problems it might cause.

A good rule of thumb is to look for terms and conditions – any genuine competition must have them; these scams usually don’t. Also look for things such as spelling mistakes and bad grammar, which you’ll often see in these scam postings, whereas any genuine competition from a large brand will have gone through several stages of proofreading.



## ONLINE BUSINESS

# Revamp a business website in five hours

**Kevin Partner** overhauls his site in no time at all with a little help from Genesis, and considers abandoning Adobe's Creative Cloud



**KEVIN PARTNER**

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**M**y writing, coding and publishing business, Scribbleit, celebrates its tenth birthday this year. While merely surviving this long is an achievement in itself – the Office for National Statistics tells us around half of businesses close within five years – the business environment has changed beyond recognition during that decade.

The economy is around 35% larger, but more important still are the changes wrought by technology. Ten years ago, I was using Office XP on an Evesham Micros PC and backing up to an Iomega Zip drive; today, I write in the cloud (using Office 2013 or Google Drive) on a Mac mini running Windows 7 and back up to Dropbox. I can work from anywhere that offers Wi-Fi, whether in my back garden using my Chromebook, or at a café table on my Nexus 7.

The work itself has hardly changed – then, as now, I was creating words for print, websites and videos – but the publication process has been revolutionised. Back then, self-publishing meant handing over your life savings to a printing company and hawking the resulting paperbacks round local and not-so-local bookshops in the boot of your car. It was called “vanity publishing”, with good reason, since it made no financial sense (except for the printer). Today, however, I can publish instantaneously to electronic devices the world over, and employ print-on-demand services such as Lulu and CreateSpace to put my paperbacks into the major online bookstores for no upfront expense. Scribbleit has become a Nielsen-registered publisher with its own range of

ISBNs, an aspect of the business I see expanding greatly in future: self-publishing is growing and changing so fast that formatting, publishing and promoting ebooks is becoming a saleable skill.

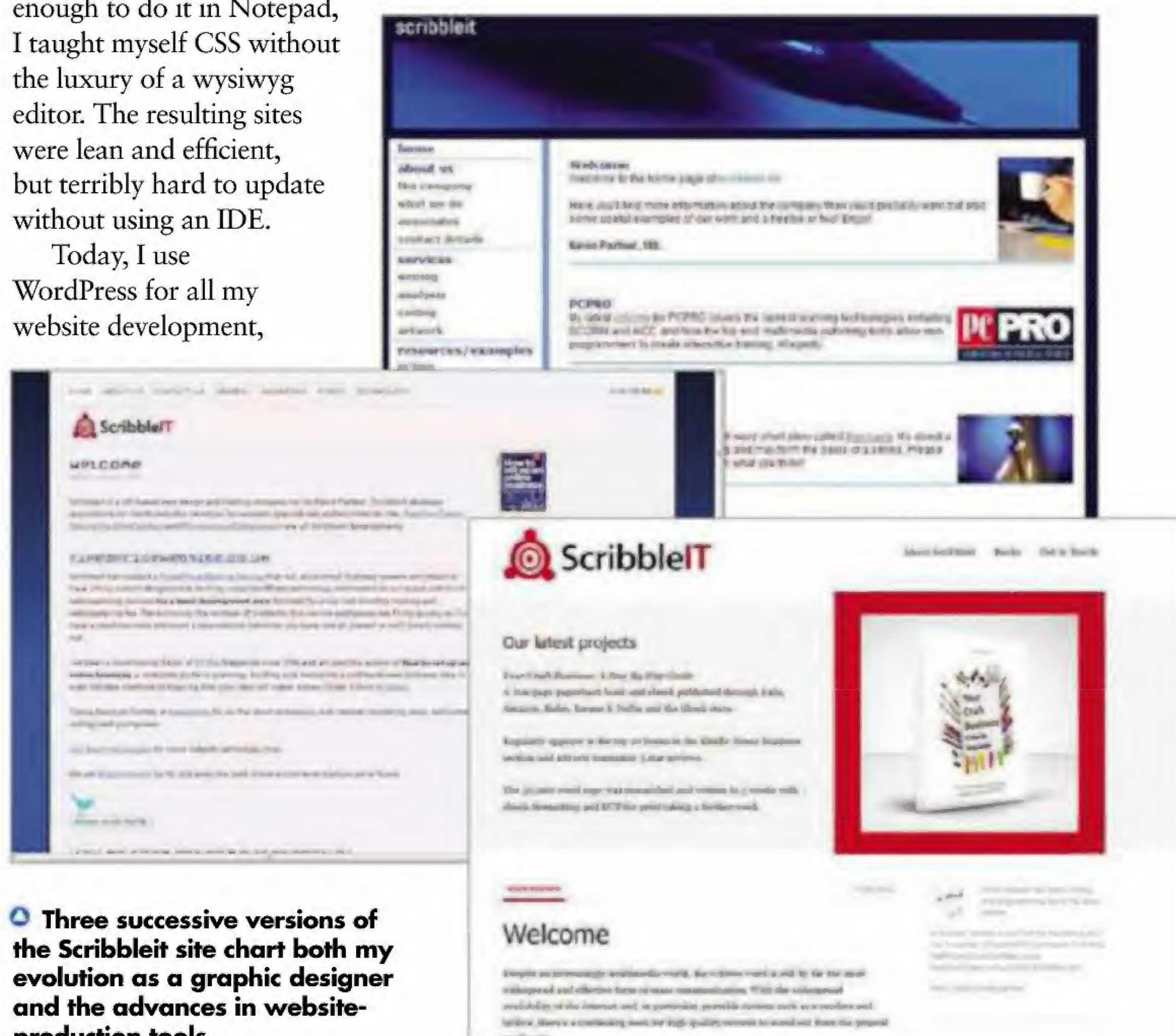
As for writing code, the main change has been my abandonment of Flash/ActionScript, but PHP and Python remain important, and the development tools I use haven't changed. The way I build websites has been transformed, however, and my recently revamped Scribbleit site is an excellent case in point.

The screenshots below show its three main evolutionary stages. Back in 2003, I was an uncomfortable Dreamweaver user – I'm slightly ashamed to present this original design for public derision, but I was a graphical novice and Dreamweaver didn't help. As my PHP knowledge deepened, I started coding sites directly, and, although I wasn't hardcore enough to do it in Notepad, I taught myself CSS without the luxury of a wysiwyg editor. The resulting sites were lean and efficient, but terribly hard to update without using an IDE.

Today, I use WordPress for all my website development,

whether for myself or for clients, which slightly limits the sort of briefs I can accept – I was recently forced to decline an invitation to create a Facebook/eBay hybrid with a budget of £400, but that's an exception. I've yet to encounter any project I seriously wanted that WordPress couldn't achieve if liberally sprinkled with custom PHP. In fact, [www.scribbleit.net](http://www.scribbleit.net) was the first site I converted to WordPress, and I discovered that, when combined with the Thesis framework (<http://diythemes.com>), it produces a good-looking, sophisticated site in a fraction of the time required to build a PHP site from scratch.

That was in 2008, and, to my shame, I'd left Scribbleit's design unchanged until recently. Originally, I set it up as a technology blog, but nowadays I prefer to use Google+ for that purpose, and, in any case, I wanted to



**Three successive versions of the Scribbleit site chart both my evolution as a graphic designer and the advances in website-production tools**



start emphasising the publishing aspect of the business rather than ranting about Apple. So, having a couple of spare days between projects, I decided to have a go at creating a replacement site, from start to finish, in that time.

The fly in the ointment was the fact Thesis underwent a complete transformation between version 1.8.x and version 2, which made all my hard-won expertise redundant. What's more, I found the new version unusable, so I decided to run an experiment to see exactly how quickly I could build a site from the ground up using only WordPress and an alternative to Thesis. The answer? Very quickly indeed.

### In the beginning: Genesis

Thesis, prior to version 2, was the best framework I'd ever come across, but it was never the only option. Its main rival is Genesis ([www.studiopress.com](http://www.studiopress.com)), which, while lacking some of Thesis' sophistication, is easier to get to grips with. It costs \$59 (£38), and I can use it across any number of sites. I decided to base my design on one of the 50 or so official themes and edit it to my needs: I chose a skin called Balance that costs \$19 (£12), bringing my total expenditure to almost exactly £50.

I purchased Genesis via a download, extracted the files, then used FileZilla to upload it to my site's WordPress Themes folder. Genesis skins are copied to the same folder, where they act as "child themes", inheriting most of their code from Genesis while adding extra functions and design elements. From the WordPress Dashboard, I activated the child theme to get access to the main Genesis controls and those of its child. Then I configured the basic settings from the Genesis submenu on the Dashboard. Genesis adds extra fields to the New Post and New Page sections, mainly

## "The excellent Synchi plugin embeds an IDE into the WordPress CSS editor"

relating to search-engine optimisation (SEO), which is a great strength of this framework.

So far, so good: in fact, the process up to this point had been quicker and simpler than the equivalent using Thesis. However, I ran into problems when it came to customising the theme. Thesis offers a neat solution through a CSS class selector called ".custom", which makes it possible to override any CSS settings in Thesis itself, while ensuring edits are preserved across framework updates. Genesis lacks this subtlety: the only way to change the look of a child theme is to directly edit its CSS file; although these edits won't be lost when Genesis is updated, they will be when a new version of the child theme replaces my customised CSS file.



● Synchi turns WordPress' basic editor into a sophisticated IDE for editing the site's CSS

WordPress has a built-in editor for making changes to CSS files, but it's extremely basic. In the past, I've used fully fledged IDEs that support remote file access (most recently Komodo Edit), but, given that I was adapting an old design, I wanted to see whether there was a neater way. There was, thanks to WordPress' extensibility, in the form of the excellent Synchi plugin ([www.pcpro.co.uk/links/225ob1](http://www.pcpro.co.uk/links/225ob1)), which embeds an IDE into the WordPress CSS editor.

The simplest way to identify which CSS selectors to amend to achieve a specific effect is to install the Web Developer extension for Firefox (the Chrome version doesn't have the same depth of features). Visit your site in Firefox and select CSS | Display Style Information from the toolbar: this lets you click on any element of the design and see which CSS rules affect it, in which files they're contained (usually STYLE.CSS), and even their line numbers. Go back to the CSS editor, scroll to that position, and make your changes. In my case,

I added the company logo and changed the colour scheme and typography, among other things, to achieve the look I was after.

### Strap on your Jetpack

WordPress has been undergoing a slight philosophy shift recently. Rather than cramming functions not every site needs into the framework, it has started hiving them off into separate plugins. For example, users of previous versions might be surprised to see the Link Manager and blogroll widgets are no longer part of the standard install, but are now add-ons. One plugin you'll almost certainly want to install immediately is Jetpack, since it bundles a host of useful extras into one place.

First and foremost, Jetpack provides site statistics; if this is your main site and you don't manage too many others, you can access stats from within the site itself, rather than a third-party service such as Google Analytics. I also employed Jetpack's share function, to add social media buttons to each post, and its contact form. All in all, I could replace half a dozen plugins with Jetpack's equivalents.

However, Jetpack has caused disturbance in the Force: there are open-sourcers who see it as the thin end of an expensive wedge, since it integrates with the VaultPress backup service, which charges a fairly hefty (but optional) monthly subscription. Also, by linking Jetpack to your WordPress.com account – a requirement of the plugin – you effectively provide a way for WordPress to gather valuable data it could use in the same way as Google and Facebook. Personally, I'm pretty relaxed at the moment, since Jetpack's usefulness outweighs any such concerns by a considerable margin, but I will be keeping an eye out for creeping commercialisation.

Overall, it took about two hours to get the new site up and running; another three hours were spent writing and publishing its initial copy and tinkering with the design. I'm happy with the end result, and in my view WordPress/Genesis is a viable route for building any basic business website, so long as you have an understanding of CSS and, crucially, are adapting an existing design. If you're building a site from scratch using a custom design, Thesis 1.8.x remains a far better choice.

Thesis opens up the guts of the WordPress framework far more thoroughly; Genesis provides a range of easily implemented options from a fixed list. Thesis sets no limits and remains my choice for custom-designed client sites, and maybe I'll find a couple of days in my schedule to devote to re-learning Thesis 2. In the meantime, however, the previous version remains my framework of choice.



## Tools for the job

There's no such thing as a typical day at Scribbleit Towers, but I spend the majority of my time writing and programming. Like most small-business proprietors, I have to be a jack-of-all-trades: I occasionally do a little design work, desktop publishing, video editing and sound mixing.

For years, I've turned to Adobe's software to help me with this. In its most recent incarnation, online subscription service Creative Cloud, I've enjoyed instantaneous access to Illustrator, Fireworks and Photoshop for graphics, InDesign for DTP, and Premiere Pro and Audition for sound and vision. It's a tempting proposition, but I'm seriously considering cancelling my subscription.

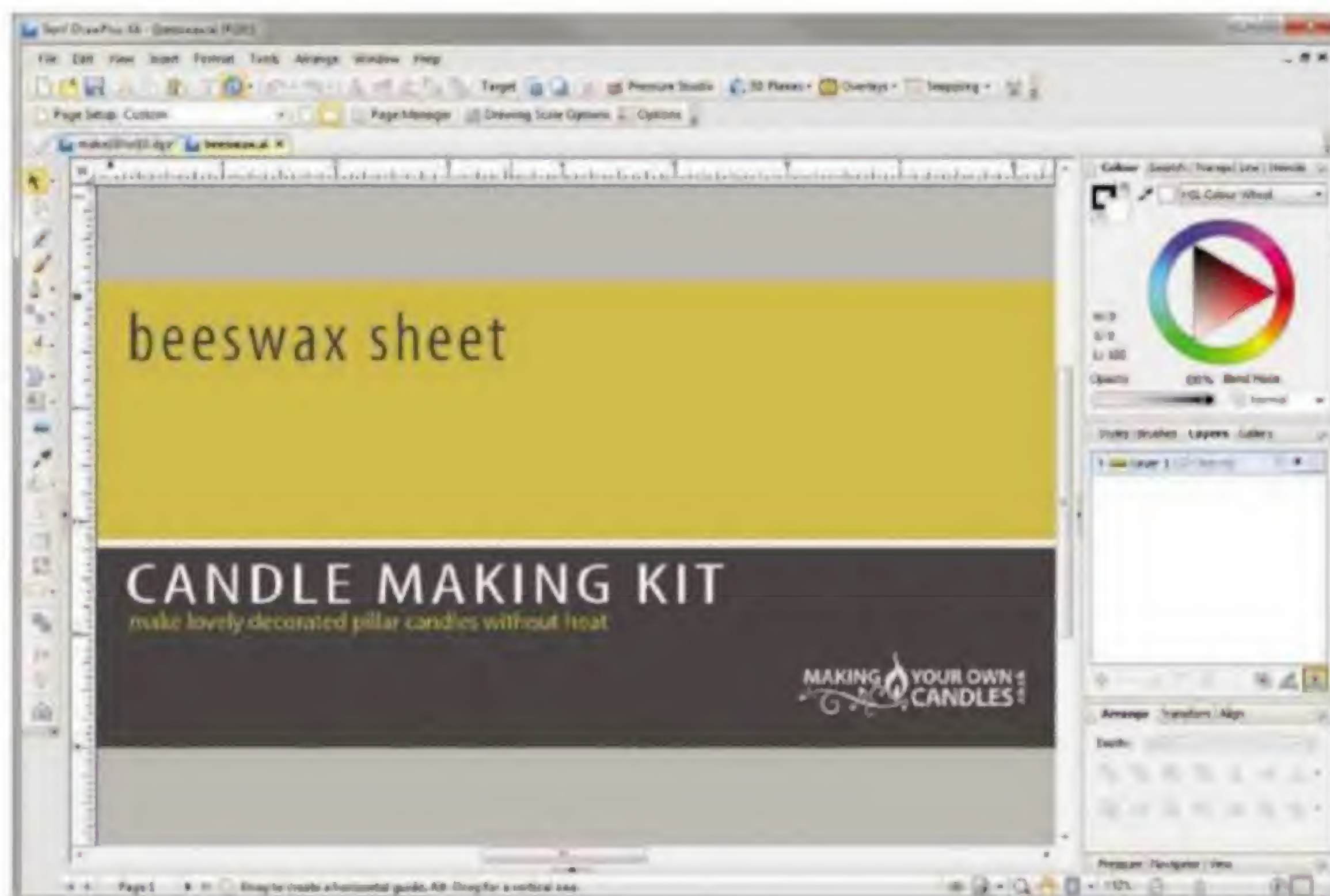
As an existing user of a Creative Suite package, I've enjoyed discounted access for almost a year, but this will shortly double to more than £50 per month. Now, £50 may not sound like much in the grand scheme of things – my monthly AdWords bill is an order of magnitude more – but I use only a tiny fraction of the suite's power. While I fire up Illustrator and Fireworks regularly, I only use the other apps occasionally, and my miserly nature abhors this level of waste. Furthermore, Adobe's software is so sophisticated and complex that getting even basic results requires learning or training, the cost of which dwarfs the subscription itself. This is the big issue for me, since I have neither the time nor the patience to learn enough to exploit the full power of this suite – I need something simpler.

British software firm Serif ([www.serif.com](http://www.serif.com)) looked, on the face of it, to be offering the perfect solution, with a range that includes replacements for most of my Adobe products: PagePlus for desktop publishing; PhotoPlus for bitmap editing; DrawPlus for vector artwork; and MoviePlus for video.

I started using PagePlus a few years ago, before InDesign became available via my cloud subscription, and it's perfect for my needs. I use it for flyers, instruction leaflets and laying out the print editions of ebooks.

However, this last task stretches PagePlus to its limits, to the extent that it runs out of memory if I launch any other application on my PC before loading the book. Otherwise, PagePlus' ease of use and low price easily outweigh the additional sophistication of InDesign. One-nil to Serif.

DrawPlus has tougher competition. In the past couple



▲ **Serif's latest version of DrawPlus, X6, is a worthy alternative to Illustrator – it does an excellent job of handling AI files, and offers standard print-output formats**

of years, I've become proficient in Illustrator for the purpose of designing labels and general vector graphics, and it would save time to stick with it rather than learn a new tool. That said, DrawPlus is far simpler, and passed the acid test of opening Illustrator files faultlessly. It also outputs print-ready files in exactly the same format as Illustrator, so I don't need to change any existing artwork to move it across. Moving to DrawPlus, then, is a matter of economics rather than ergonomics – the latest version, X6, arrived in March at around £80, but the previous version costs only £20 ([www.pcpro.co.uk/links/225ob2](http://www.pcpro.co.uk/links/225ob2)). If necessary, this can be upgraded for a total price less than the cost of buying X6 directly. As much as I like Illustrator, DrawPlus does everything I need for less. Two-nil to Serif.

It gets even better with MoviePlus. I make my demonstration videos by recording a soundtrack via a lapel microphone onto a Zoom H1 digital recorder, then combining this with the video track from a digital camcorder. Good sound is the key to a professional demo, and, although this approach is more complicated than using the camcorder's own audio track, the result is worth the effort. MoviePlus has quickly established itself as my favourite video editor, since it offers the perfect balance of features, configurability, ease of use and

performance. While Adobe Premiere brings my Mac mini grinding to a halt and presents a bewildering array of options at every step, MoviePlus does the job in a straightforward, efficient way. Three-nil.

If only PhotoPlus were up to the same standard. In fairness, I'm more familiar with Adobe Fireworks than any other component of Creative Cloud, having used it since its launch as Macromedia's Photoshop competitor, so my workflow is far deeper set in stone. But even allowing for such bias, PhotoPlus is disappointing. It offers extensive photo-editing features, and it's easy to use, but, as a general-purpose bitmap editor, it simply can't compete with either Fireworks or Photoshop. Its text handling is primitive at best, for example.

Now, I don't expect my bitmap editor to be as typographically sophisticated as a DTP application, but I do expect it to be able to create and edit a quick web banner. PhotoPlus' only saving grace is that there's so much overlap with DrawPlus I can often make a banner in the latter and import it to the former as a JPEG. I could probably get used to PhotoPlus and bend it to my will, but it would be a real wrench.

With a couple of months left of my discounted Creative Cloud subscription, I've switched entirely to Serif's products to see whether they let me produce, in the real world, the same results in the same time for a far lower price. While Serif's range tends to be marketed for "home" users, it's now professional enough for most of the purposes an online business could throw at it. If you're a big design studio that needs to share files in industry-standard formats, Serif can't help (and you're probably using Macs, in any case). Otherwise, Serif's fast-maturing product range offers a viable alternative at a far lower cost. ♦

### Send to Kindle

Amazon has launched the rather lovely "Send to Kindle" button, which, when embedded in your website, enables visitors to send a version of the site content to their Kindle so they can view it offline. The simplest way to implement this is by using Amazon's WordPress plugin, but you can also grab code links for standard websites from Amazon ([www.pcpro.co.uk/links/225ob3](http://www.pcpro.co.uk/links/225ob3)). I've tested this feature on one of our blogs and it works beautifully, especially for walkthroughs. Amazon has done a good job of picking up the relevant CSS from the site and creating a readable version that works well on E Ink devices and the Amazon Kindle app.

Good sound is the key to a professional demo, and, although this approach is more complicated than using the camcorder's own audio track, the result is worth the effort. MoviePlus has quickly established itself as my favourite video editor, since it offers the perfect balance of features, configurability, ease of use and



## SECURITY &amp; SOCIAL NETWORKING

# Let's talk about double-barrel phishing

**Davey Winder** tackles the ever-mutating threat from phishing – in particular, the growth of conversational attacks


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**R**ecent research conducted by OnePoll suggests that 60% of office workers in the UK receive a phishing email every day, while 6% get more than ten a day. I wouldn't bat an eyelid at these numbers if they related to a consumer audience, but the fact that this was a poll of the business sector is surely cause for concern. After all, doesn't pretty much every business in the land have some kind of technical defence in place to deal with spam and email-borne malware? Evidently, these defences aren't working as well as they should. Interestingly, the same poll suggests that roughly the same 60% of workers will fall for a phishing scam unless they've been trained to spot one. Some 27% of the office workers polled had no idea what phishing is, while one in five admitted they'd

**"Roughly 60% of workers will fall for a phishing scam unless they've been trained"**

fallen victim by clicking on a link or opening a dodgy attachment.

Earlier this year, I wrote a *PC Pro* feature about how to protect your business against spear-phishing (web ID: 378982), in which I concluded that education is the key to successful protection against this social-engineering menace. Unfortunately, the process of educating yourself and your workers can feel rather like painting the Forth Bridge, in that it appears to be a



never-ending, cyclical task. But, if you look beyond the urban myth, the Forth Bridge has never been continuously painted, and the maintenance contracts for painting it have continually improved – the latest job, completed a couple of years ago, is expected to last for 25 years. Painting the bridge isn't trivial, and it does take several years, but the investment pays off in the years that follow.

That's the analogy I'd apply to the phishing problem, to counter the defeatist view that claims the bad guys come up with a new threat – and force you to start re-educating from scratch – every time you think you have them sussed. You don't have to do anything of the sort. If you'll excuse me belabouring my painting analogy, all you need do is make sure the base coat is thick enough, then touch it up as necessary.

Teaching your staff how to spot the most common mistakes social engineers make when they build their phishing lures will make it easier to spot scams when they're confronted

with a more personalised attack. To illustrate this by way of an example, *PC Pro* reader Neill Lillywhite forwarded me a copy of a phishing email he received that would certainly have been enough to fool most uneducated readers, since it was a pretty convincing clone of a typical PayPal transaction notification. However, Neill spotted that its sender had made several small errors that were enough to set off alarm bells.

The mistakes were basic. The account to which the fake email was sent wasn't the one Neill normally uses for PayPal; most people use the same address for almost everything and so wouldn't notice anything amiss. Far sloppier mistakes included the use of a bald "Hello" (rather than Neill's username) as the greeting, an incorrect date (the email was dated after the day of receipt), and the fact the email claimed to be from [www.paypal.com](http://www.paypal.com) rather than [www.paypal.co.uk](http://www.paypal.co.uk), which Neill normally deals with.

All these goofs seem obvious once they've been pointed out, but they're easy to miss when you're skimming over email – especially if you've never received anti-phishing training.





**This fraudulent PayPal transaction notification is convincing – until you look closer and spot the errors**

Perhaps the biggest error of all in this correspondence is that, if you hover over the PayPal links in the message, they reveal the destination URL is a Russian website. Forget the fact you'd never bought the item described – that's actually the clever part of this social-engineering trap. It triggers your "thieving corporation" reflex and almost guarantees you'll dash off a fuming email of complaint. No, they don't expect to fool you into paying for goods you didn't buy; they expect to fool you into clicking the reply link.

If you and your staff were properly educated, then even if you fell for the main premise – believing goods had been ordered – and missed all these other clues, you still wouldn't click a reply link in the message itself, but rather visit the site concerned using your own browser bookmark.

## Unicode override

What if the scammers are a little smarter, however, and are practising the sport of "spear-phishing", where an attack is targeted at a specific company, or even a single employee? In such scenarios, there's less chance they'll use such a lightly obfuscated link in the hope you'll be fooled into clicking it. They're far more likely to use a file attachment that initiates something nasty.

Of course, the "don't open unexpected attachments from untrusted sources" rule applies here, but it's often overlooked in the heat of the moment, especially if an obfuscation technique known as Right-to-Left Override (RLO) or bidirectional text in Unicode is being applied. This trick has been around for yonks, and it's based on Unicode character U+202E, an override that switches on support for Arabic and Hebrew languages that are written right to left.

The character can be used to fool recipients who are too savvy to click on an obvious executable file into running one anyway. Consider an executable named CONFERENCE REPORT, 2013\_ANN[U+202E]FDP.EXE. The placement of that RLO character makes it display on your screen instead as CONFERENCE REPORT, 2013\_ANNEXE.PDF, which now appears to be a docile PDF document rather than an executable file. Even allowing for the fact many people are less trusting of PDFs than they used to be – thanks to a spate of Adobe vulnerabilities and exploits, and the fact some email services now block even obfuscated executables – this technique still catches enough people to be profitable for the bad guys.

This brings us back to the "education, education, education" mantra. If your users are taught to be wary of all unexpected attachments, executables and documents, such attacks ought to fail.

Or so you might think. After all, education teaches us that, when we receive an attachment, even from a trusted or quasi-trusted source, best practice is to reply and ask what's in it by way of validation. But even that approach isn't entirely foolproof.

## Double-barrel conversational phishing

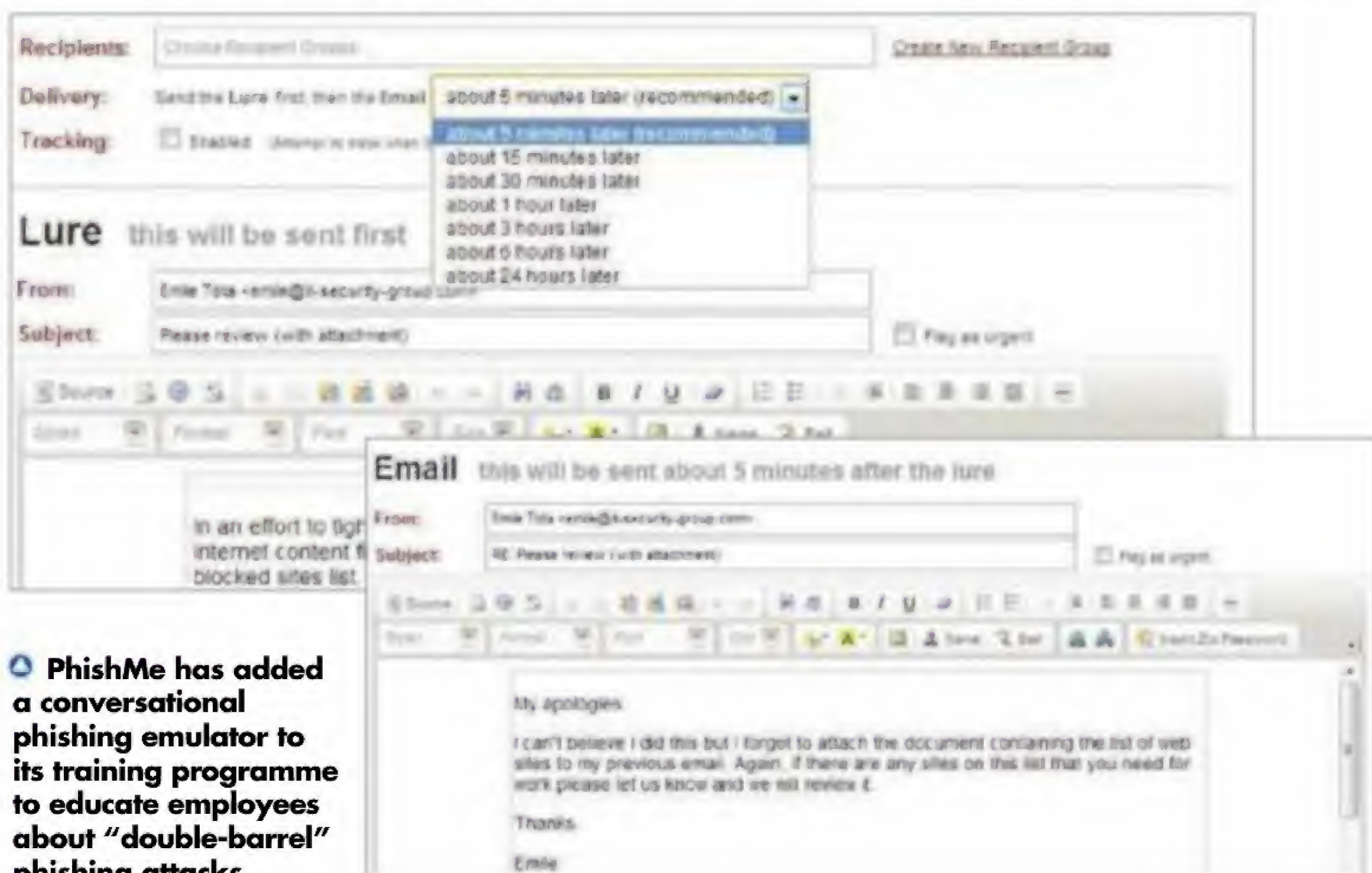
At the simplest level, conversational phishing can be as basic as engendering trust in the recipient of the malicious attachment by responding positively to any reply. You receive an email that appears highly pertinent to you

and your role, but nevertheless your instincts and training kick in and raise a shadow of a doubt. Since you're not 100% sure whether it's fake or genuine, you reply to the sender expressing your concern; they reply in an understanding tone to reassure you the email and attached document are legitimate. This simple act of engaging in polite conversation may be enough to add the validity you're looking for.

Other examples of conversational targeted phishing include sending an initial email claiming to have bumped into the recipient at a conference – diligent social engineers may have skimmed your Facebook page and spotted your status updates from said conference – and suggesting the attached report might be of interest. However, no report is attached; it comes in a follow-up email where they pull the "whoops, forgot to attach it" conversational gambit. Variants of this trick involve offering a copy of a report, but no attachment, then following up a day or two later with the file and a "just in case you were interested" comment.

The one thing all these conversational phishing techniques have in common is that they employ a bait-and-trap tactic. The initial email acts as the lure, while the follow-up sets the spring on the trap. Phishing awareness training specialist PhishMe ([www.phishme.com](http://www.phishme.com)) employs a phishing simulation system that enables you to effectively try to scam your own staff. It's a clever idea, with highly customisable phishing emulations across a number of different attack vectors, including the conversational phishing technique.

I quite like the idea of using this real-world approach, not least because it identifies those who need further training in your organisation, and saves you teaching any grandmas to suck eggs. I wouldn't recommend using PhishMe – or any other such system, including your own in-house educational awareness programme –



**PhishMe has added a conversational phishing emulator to its training programme to educate employees about "double-barrel" phishing attacks**





Read Kevin Partner's "Raspberry Pi for beginners"  
Buy from [www.magbooks.com](http://www.magbooks.com)



#### Pwnie Express' Raspberry Pwn turns the Raspberry Pi into a portable pen-testing kit

in isolation, though. The most effective data protection comes through combining technical defences with user awareness, and this is as true with phishing as with any other form of attack.

### Longlining

If, after all this, you think your anti-phishing strategy is robust enough at network-edge level not to require further education, think again. Investing in filtering systems that claim to stop phishing messages at the gateway doesn't mean your users will never see them. That's because targeted spear-phishing and traditional mail-bombing attacks are merging to create yet another new genre in the email scam game – longlining.

This name isn't simply another fishing pun, but rather a literal description of how this technique works. Longline fishing is a commercial practice that employs a single line several miles long, baited with thousands of individual hooks. Longline phishing gets around traditional security systems by a process of "mass customisation", employing a rapid bombardment of thousands of uniquely targeted messages. Many security gateway filters will be looking for identical or similar messages from a single source, so they won't detect a longline attack, the messages of which have widely differing subject lines, content and, most importantly, originating IP addresses.

This multiple-hook analogy applies to the body content of the messages themselves, which will contain multiple variations of the embedded malware target URL, the ultimate destination of which will almost always be a trusted site that's been compromised in some way (which helps evade reputational filtering on the URL). Think of longlining as a parallel phishing delivery system and you're in the right ballpark.

Armed with the capability to send hundreds of thousands of these malicious URL hooks in a matter of hours, plus the ability to bypass many corporate gateway filtering systems, the bad guys increase their chance of exploiting a zero-day vulnerability before the IT department has been able to patch it. I've heard longlining described as "combining the effectiveness of spear-phishing with the speed and scale of a

virus attack" – and that scares me, even if it doesn't scare you. It would certainly encourage me to make sure my IT security education programme was up to date.

### Life of Pi

I'm guessing the average *PC Pro* reader is pretty much the target market for the Raspberry Pi. I don't buy into the official rationale that it's aimed at teaching kids basic computing skills or bringing affordable computing to the masses. Nope, the Pi is for people with a pre-existing interest in computing, who enjoy being hands-on and think "what can I make that do?" when they see a single-board computer covered in naked chips. *PC Pro* has already taken a close look at some of the projects Pi enthusiasts have undertaken (web ID: 378817), and explained how it's possible to code your own games for it (web ID: 376867).

However, not everyone seems to take such a positive view. I'm talking about those who recently launched a concerted DDoS attack against the official website operated by the Raspberry Pi Foundation.

Not for the first time, the Pi site was taken down by a DDoS, and this time it was a big one. The site was down for only a short while, but the attacks were launched from a million-node botnet and described by experts as a significant SYN flood. These kinds of botnets are available for hire nowadays, but big ones such as this don't come cheap, and they aren't usually the domain of spotty teens with grudges. That's especially true in this case, as I'm led to believe these attacks took place over a couple of days, meaning even more cost for the attackers, which suggests it may have been a blackmail attempt rather than score-settling, which wouldn't surprise me at all.

What does surprise me, however, is

that this is the second time in less than a year that the Raspberry Pi Foundation, a charitable organisation, has been targeted. The first occasion also involved a biggish botnet, which employed 110Mbps/sec of SYN packets into port 80 to knock the site offline. At the time, it was suggested it might have been launched by someone who'd been banned from the support forums for being an idiot, or else was a blackmail attempt (although no further support for either hypothesis was released in public). An associated site was taken down a week later, which suggests a degree of organisation behind the attacks.

The good news is that the Raspberry Pi Foundation has been looking at ways to mitigate such DDoS attacks, and the site is back up and running perfectly normally as I write. However, it did get me thinking about how you could flip this bad news around by programming the Pi to become a security tool.

The most interesting project I've discovered so far is something called Raspberry Pwn, from Pwnie Express (<http://pwnieexpress.com>), a firm that specialises in bleeding-edge penetration-testing devices. Raspberry Pwn is a Debian-based pen-testing distribution for the Pi that provides a whole bunch of open-source security tools, and by so doing turns the Pi into a fully functioning and highly portable pen-testing and security-auditing platform.

I'm also aware of people using the Pi as a secure browsing VPN

server, which is neat, but I'm sure there must be more that people are doing with it in the field of IT security, and I'm certain readers of *PC Pro* will be among these innovators. So, to get to the point, if you're using your Raspberry Pi in this way, please let me know – we'll feature some of the most innovative applications in a future issue, or on the *PC Pro* website.

### Dirty devices

When you read that 78% of people asked by researchers admitted they've picked up and plugged in a USB device they found lying around, you might think "nothing new there". However, the research was conducted at the RSA Conference this year, and the people involved are all IT security professionals. Pavement hacking – leaving malware-infected USB sticks abandoned near a target office – is nothing new. Given these statistics, it's unlikely to be a practice that grows old anytime soon, either – the same survey reckons 68% of those asked had fallen victim to a security breach, many related directly to that infected USB device...



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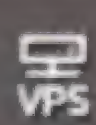
Domain  
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Emails



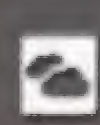
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## OFFICE APPLICATIONS

# Correcting your word processing

You don't have to rely on Word's built-in spelling and grammar tools.

**Simon Jones** looks at the benefits of three alternatives



**SIMON JONES**

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**H**ow's your grammar? Do you have a well-thumbed copy of *Fowler's Modern English Usage* on your desk, or do you sprinkle apostrophes liberally in the hope some of them will land in the right places? Microsoft Word, and most other word processors, will check your grammar and spelling if you ask it to, and this helps most people – we all make mistakes. But is Word's grammar checking any good, or are there better tools available elsewhere?

The spelling and grammar settings in Word are found in Options, under the heading Proofing. By default, Word will check your spelling as you type, with errors indicated by those red squiggly underlines, but you can also turn on three main settings for grammar checking. "Mark grammar errors as you type" inserts blue squiggly underlines to indicate possible grammar errors, as well as red ones for spelling. If you'd prefer only to see grammar

## "Word will check your spelling as you type, but you can turn on three grammar settings"

errors when you press F7 or click Review | Proofing | Spelling & Grammar, tick "Check grammar with spelling". This is less intrusive, since the grammar check won't distract your attention while you're typing, but you do have to remember to initiate the check manually when you've finished writing. The third option determines whether Word checks

only for major grammatical errors, or for what it terms "Grammar & Style": this more extensive style checking can be useful, and you can control which rules Word applies during grammar checking by clicking the "Settings..." button.

The top three grammar settings address punctuation, and are set to "don't check" by default. They concern the number of spaces left between sentences, the punctuation around quotation marks, and the use of commas in lists. When typewriters

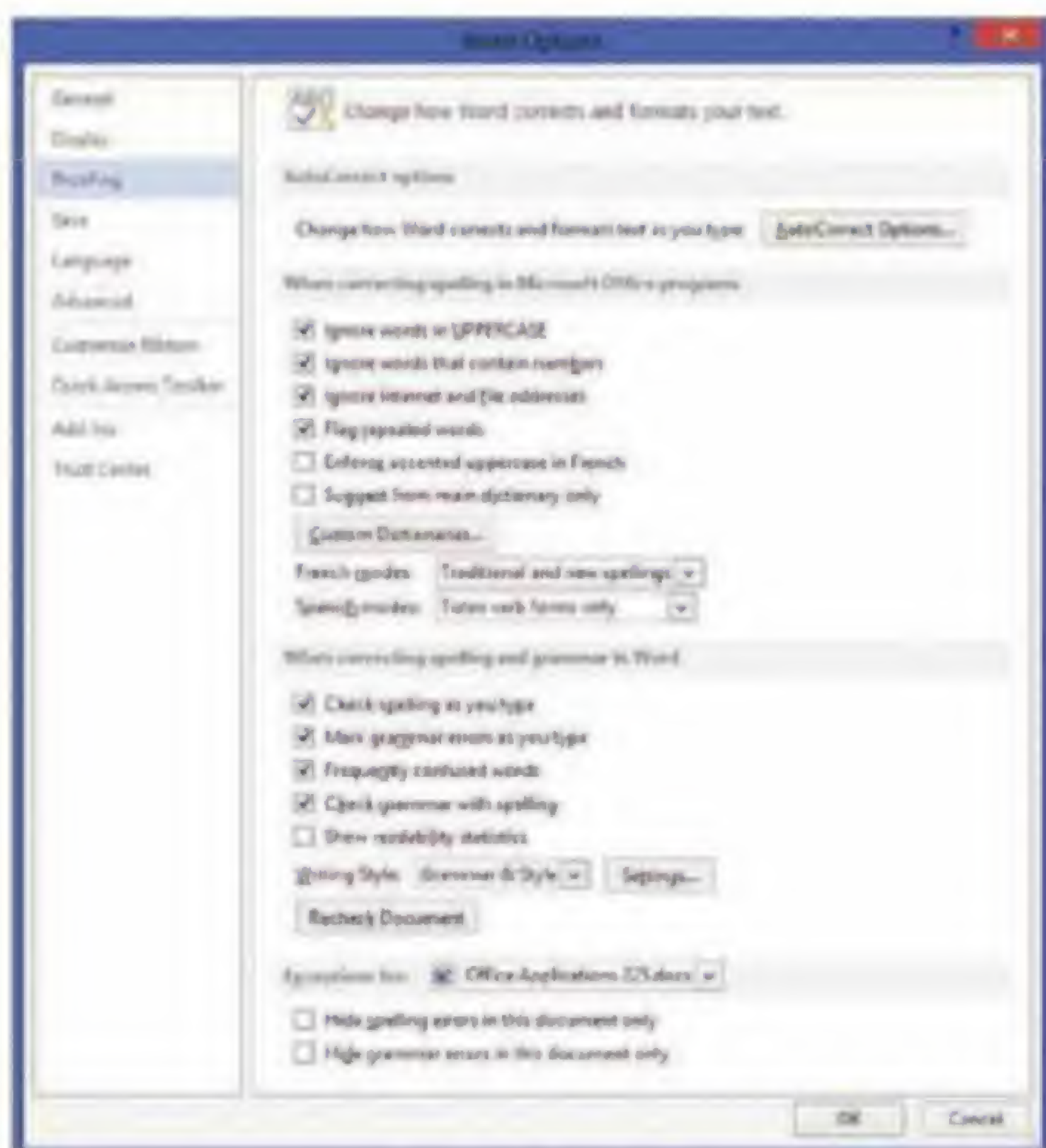
used to have only one, mono-spaced font, their simple advancing mechanism meant every character took up the same horizontal space, whether it was a lower-case "i", a capital "W", or a full stop. People noticed that their typewritten sentences – unlike those in typeset books, the characters of which were proportionally spaced – looked as if they ran

into each other, because a full stop plus a space didn't look much different from one space. As a result, typing courses started suggesting the use of two spaces after each full stop, to help the eye find the end of sentences. However, most modern word processors use proportionally spaced fonts, so one space is usually enough; a double space looks wrong. As such, setting Word to check for one space at the end of sentences makes sense for most documents, although if you're typing a manuscript in a mono-spaced font such as Courier New or Consolas, you might want to insist on two spaces.

Punctuation inside quotation marks is problematic, since there are many different legitimate uses – reporting a question, questioning a statement and so on. Word's checking is a little simplistic, as it deals only with the case where a subordinate clause follows a simple quote. Take, as an example, the following sentence: *While critics call the acting "inspired", they point out inconsistencies in the plot.* I remember being taught 40 years







#### Turn on grammar checking in Word

ago that the comma should go inside the quotation marks, but in modern British English you wouldn't do that – the critics in question didn't say “inspired comma”, so it's perverse to insist the comma comes before the closing quotation mark. Nevertheless, you can set Word to check either way.

A comma used before the last item in a list is often called an “Oxford comma”, because it's required by Oxford University Press. It's almost universally used in American English, too, but it's fallen out of favour in British English, despite helping to clarify ambiguous sentences. An example of a sentence made unambiguous by an Oxford comma is *She took a photograph of her parents, the president, and the prime minister*. Without the final comma, the sentence could mean either that the photograph contains four people, or that it contains only two – her parents, who are the president and the prime minister.

If you don't like Oxford commas, you can usually reword the sentence to avoid ambiguity. For example, the meaning of the sentence *She took a photograph of the president, the prime minister and her parents* is clear whether or not there's a comma before the “and”. I used to be firmly in the anti-Oxford comma camp, but I've slowly been won over.

The help text for the “Grammar settings” dialog adequately explains most of the other settings, which include possessives and plurals, relative clauses and subject-verb agreement. In plain English, this means the use of apostrophes, confusion between “who”, “which”, “that” and “whose”, and singular nouns being used with plural verb forms and vice versa.

Word's style rules seek to eliminate clichés, jargon, contractions, hyphenation and sentences starting with “and” or “but”. I usually have all these checks turned on, except for contractions,

fragments, passive sentences and use of the first person. While many people find the use of the active voice more direct and engaging, I find using only active voice robs my writing of variety. It also risks treating readers like idiots who are incapable of understanding “the ball was kicked by the boy” as well as “the boy kicked the ball”. As for the first person, since I'm a columnist employed to write about my work and opinions, avoiding “I”, “me” and “my” would sound very stilted, “in this writer's opinion”. *PC Pro's* house style mandates the use of contractions such as “he's” rather than “he is” to lend a more conversational air, and permits sentences that start with “and” or “but” (although I try to avoid them).

Word's grammar checking is reasonably powerful, but you'll still have to ignore a few false positives – it can't be expected to understand everything you write. When you finish writing, it's useful to go back to File | Options | Proofing and click “Recheck document” – which clears all your manual settings and checks the spelling and grammar again – so you can see if you can further improve your piece.

### Pro Writing Aid

An alternative to rechecking documents with Word's built-in grammar checker is applying a tool from another manufacturer. One such tool, Pro Writing Aid (<http://prowritingaid.com>), is both a website and a Word add-in, which undertakes extensive grammar checks to locate common and not-so-common mistakes, and suggests improvements. You can either paste text into the website, or download the add-in and run checks directly from Word. The website doesn't retain your text, but the remote processing means it takes a few seconds for the results to come back.

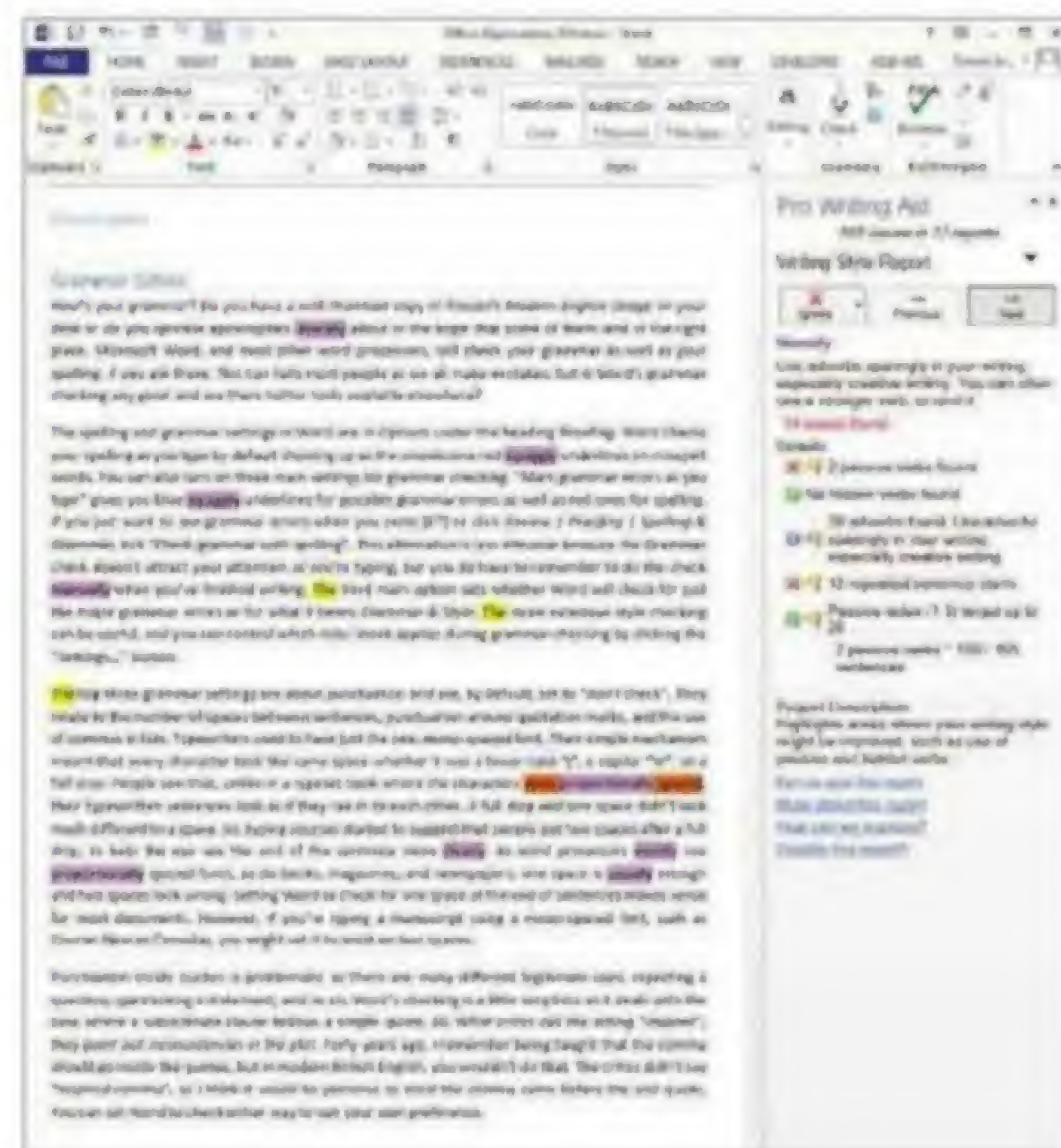
Pro Writing Aid produces up to 19 different reports, covering issues including overused words, sentence length variation, complex words and “sticky” sentences (that is, sentences that contain a large number of “glue words” – short words the reader has to wade through to get to the meaning). The Options panel lets you choose which reports to run; cutting down the number you run speeds up processing. A summary page shows which reports found problems, and from there you can drill down into the individual reports, which

highlight any problems in different colours. When editing in Word, these highlights appear as changes to your document, so you won't want to have “Track changes” turned on or you'll be overwhelmed with amendments. There's a button on Pro Writing Aid's toolbar to remove these highlights, but it overwrites any background colours you've used in your text.

Pro Writing Aid offers two levels of service: free and premium. The free service lets you use the website and many of the reports; premium, which costs \$35 a year, adds seven extra reports and allows you to edit your text on the website or use the add-in (for Word 2007 and above). There's a 14-day free trial, plus a 14-day money-back guarantee. I found many of the reports useful and their presentation quite clear, but, as with Word's grammar tools, you have to ignore many false positives.

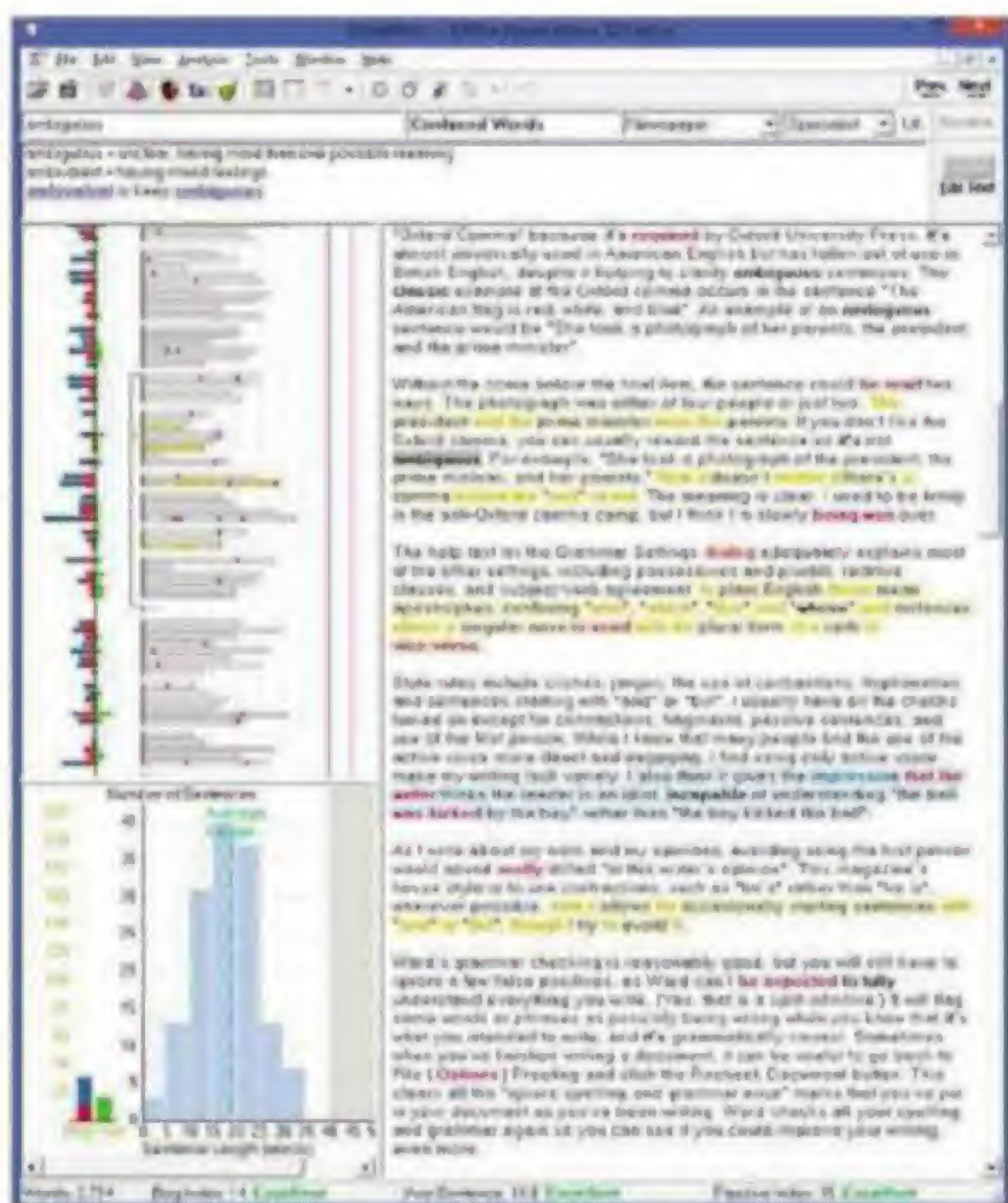
### Grammarly

Grammarly ([www.grammarly.com](http://www.grammarly.com)), like Pro Writing Aid, is both a website and a Word add-in, and it also sends your text to its website for checking without retaining it. Grammarly's task pane inside Word is presented slightly better than that of Pro Writing Aid, and, once triggered, it checks your text as you type, indicating errors with green squiggles and adding suggestions to the right-click context menu. It also offers full explanations and examples in its task pane, although the language it employs can be a little intimidating: when it says “Review this sentence for gerund/infinitive use”, I imagine those small, furry creatures with pointed noses and sharp teeth that Ronald Searle drew for the Molesworth books. Gerunds are verbs that are used as nouns, as in “I enjoy playing football”, where the subject is “I”, the verb is “enjoy” and



#### Pro Writing Aid's individual reports highlight suspect words and phrases in your text





StyleWriter's interface looks old-fashioned, but it offers useful graphical representations of your sentences

“playing football” is the object, even though “playing” is the present participle of the verb “play”. Don’t confuse a gerund with a gerundive (the small furry creatures’ offspring), which in Latin is a verb used as an adjective.

The only option you can set in Grammarly is the writing style of your document, which can be general, business, academic, technical, creative or casual. This rather forces you to adapt to its way of writing, or ignore many “errors”. When set to general style, it shows a lot of blue underlines in your text where it finds possible synonyms, and, although it allows you to ignore these “mistakes”, it grates on me that these suggestions are presented as though they’re correcting an error. The task pane calls them “enhancements”, which is better. Switching to technical style turns off suggestions altogether.

Grammarly allows you to check your document for plagiarism, but I’m not sure how useful this is. Using a sequence of only seven words in your document that also occurs somewhere on the internet triggers this warning, which also suggests you insert a reference – in MLA, APA, or Chicago format – to the web text it has found, but this should be taken with a pinch of salt (oh, a cliché). It declares this column 4% plagiarised, since, among other things, it contains the phrase “using a mono-spaced font, such as Courier”, which Grammarly found in an article at [www.codeproject.com](http://www.codeproject.com) about presenting programming code on websites ([www.pcpro.co.uk/links/225oa1](http://www.pcpro.co.uk/links/225oa1)). Other references it found concerned horse racing, website marketing and the joy of cooking with rice flour (thanks to the phrase “a well-thumbed copy”). An adjustable threshold would make more sense: perhaps

suspected plagiarism should be reported only if it accounts for more than 10% of a document, or if all the putative references point to the same document.

Grammarly costs \$30 a month, but buying three months at a time reduces this to \$20, and buying one year reduces it to \$12. You have to hand over payment details to try the program, but there’s a seven-day trial period before you’re charged (you must cancel within that time if you don’t want to continue).

### StyleWriter

StyleWriter ([www.editorsoftware.com](http://www.editorsoftware.com)) takes a more old-fashioned, less cloudy approach to Word integration, but it does much the same job as the other two. Checking doesn’t happen on a website; instead, you install an application on your PC containing all its rules, and it adds a toolbar to Word that launches this application and passes

it the text of your document. While using StyleWriter, you’re bouncing back and forth between its window, where you see the errors, and Word, where you edit the text, but this works surprisingly well, particularly if you have a large monitor and can dock the two windows side by side. Alternatively, StyleWriter can automatically shrink its window when you switch to Word and grow it again when you switch back.

StyleWriter suspends processing while you edit the text in Word and resumes, with your changes, when you return to its window. It shows a graphical representation of your sentences in a panel on the left, with charts indicating the length of your sentences and their “Bog” and “Pep” scores. Sentences with a high Bog index contain a lot of difficult words, initials or acronyms, while high Pep words, such as names, adjectives, personal pronouns, contractions and phrasal verbs, add interest. Aiming for less Bog and more Pep yields a more interesting document that’s easier to read. StyleWriter picks out sentences that are too long, and its sentence-length chart shows whether you have

a preponderance of short or long sentences. You want a wide spread of different lengths to add interest, but they should cluster around a mean of 18 to 20 words: too many short sentences make a piece look disjointed or childish; too many long ones make it difficult to read.

StyleWriter shows which words you’re overusing, and those that are overcomplicated or can be easily confused. It suggests how to improve the text in a box at the top of the window, which highlights glue words and the sentences that contain too many of them. It also scores your article overall for its Bog index, sentence length, reading grade and passive index (the percentage of passive verbs in the piece). Grading these scores as Poor, Good, Excellent and so on, gives you a better idea of how you’re doing than the raw figures presented by other tools.

You can choose from 20 different writing styles – such as academic, newspaper, letter, report and speech – and also specify your audience from public, in-house and specialist. These two settings apply different thresholds for all the “mistakes” StyleWriter detects. You can also turn on or off the different style categories, and choose how they’ll be highlighted in the text. StyleWriter’s user

## “You can choose from 20 different writing styles – such as academic – in StyleWriter”

interface looks a little old-fashioned and could certainly be improved, but it’s powerful.

Doing all the processing on your PC means confidentiality isn’t a concern, and StyleWriter also runs far faster than Pro Writing Aid or Grammarly. It occasionally highlights the wrong words when switching from StyleWriter to Word windows, but otherwise it’s reasonably stable. As with all the other products mentioned here, you’ll have to wade through many false positives, but the result is usually worth it.

StyleWriter costs \$90 for the Starter Edition, \$150 for the Standard Edition and \$190 for the Professional Edition. The licence covers one person using the software on one computer in perpetuity; for \$30 more, you can extend the licence to cover up to three computers (but still for only one person). A free 14-day trial is available.

### Style over substance?

All three style-checking tools here can be pedantic and infuriating at times, but that’s mostly because computers are nowhere near as clever as humans. All three complained that I use too many adverbs, because they’re skewed to prefer adjectives and similes. They don’t know whether I can tell the difference between “loose” and “lose”, so they question me every time I use either. Some of the tools disagree with one another, or with Word, about what constitutes correct spelling or grammar, but they do offer useful advice, and any help is better than none.



## WEB APPS &amp; DESIGN

# Too little, too late?

Dreamweaver has refocused on HTML5, but **Tom Arah** still doesn't hold out much hope for the future of Adobe's market-leading program



**TOM ARAH**

Set up his Edinburgh-based design company in 1987. As well as design work, he provides training and consultancy. Email [tomarah@designer-info.com](mailto:tomarah@designer-info.com)

**F**our years ago, I announced that "Dreamweaver is dying", that hands-on HTML authoring was over, and the future belonged to upcoming CMSes such as WordPress and Drupal. Oops.

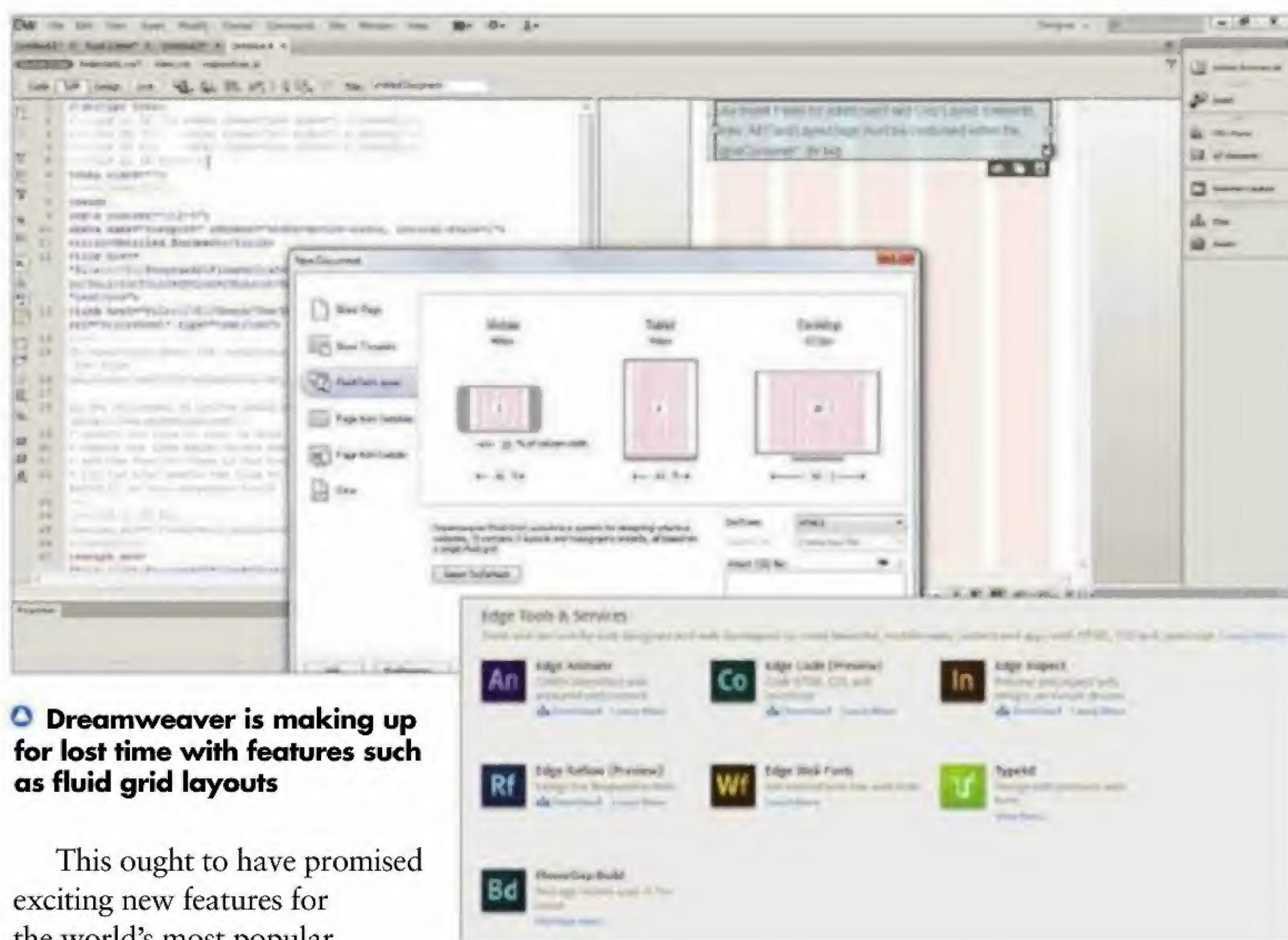
Hands-on web design is still very much with us, and so is Dreamweaver, a fact that was rubbed in recently at an Adobe "Create the Web" session, when the presenter asked how many people in the room were still using the program – almost every hand went up. So, why is Dreamweaver still thriving?

The answer can be summed up in one word: HTML5. When I wrote that piece in 2009, HTML4 and CSS 2 were both more than ten years old; web designers understood the fundamentally limited platform they provided; and the World Wide Web Consortium (W3C) planned to rewrite both in XML to set them in stone.

But that year saw an extraordinary turnaround. Many browser developers had

## "In 2009, the W3C accepted defeat and embraced WHATWG's HTML5"

been dissatisfied with the limitations, and, after the W3C rejected their initial proposals, Mozilla and Opera joined forces with Apple to create the independent Web Hypertext Application Technology Working Group (WHATWG) and push forward the capabilities of HTML, CSS and JavaScript. In 2009, the W3C accepted defeat, dumped its own XHTML working group, and embraced WHATWG's initiative, handing the future of the web to the browser developers and their evolving HTML5.



**Dreamweaver is making up for lost time with features such as fluid grid layouts**

This ought to have promised exciting new features for the world's most popular web-authoring tool, but Dreamweaver continued to act as if HTML5 didn't exist.

To be fair, there were good practical reasons. The web is universal or it's nothing, and there's no point creating all-singing, all-dancing pages that most of your audience can't view. Web designers, as a general rule, work to the lowest common denominator, which meant waiting until all non-HTML5 browsers had been flushed from the system – a very distant prospect. Another factor was that Adobe already had its own, extremely successful, web-application technology

in Flash, and was determined to exploit the edge this granted it and its users. As Adobe focused on this strategy, Dreamweaver looked increasingly like a tool merely for wrapping SWF-based Flash applications in HTML. Also, since Flash was universally supported by desktop browsers, and could do everything HTML5 was promising to deliver – and plenty more besides – the need to switch to the less powerful, less universal HTML5 was debatable at best.

**Adobe's HTML vision is increasingly built around its new Edge tools and services, not Dreamweaver**

I've covered the denouement of this tale extensively in past columns (*see issue 207, p91 and issue 213, p91*). Steve Jobs turned the web upside down by announcing, the day before the launch of Adobe's Creative Suite 5, that Apple wouldn't be supporting Flash on the iPhone or the iPad. Robbed of universal delivery on these next-generation devices, Flash in the browser was doomed to decline rapidly. To deliver rich web content, and stream video to iOS devices, suddenly you had to embrace HTML5. Like the W3C before it, Adobe was powerless to control the evolution of the web, and Flash went the way of XHTML. The blog post in which Jobs signed Flash's death warrant concluded:

"Perhaps Adobe should focus more on creating great HTML5 tools for the future, and less on criticizing Apple for leaving the past behind."

That was advice Adobe had no choice but to take, and in April 2011 Dreamweaver CS5.5 appeared, with its focus switched to HTML5 – and almost no mention of Flash. Coding capabilities were finally updated to support HTML5's crucial `<video>`, `<audio>` and `<canvas>` elements, and, thanks to an updated version of the in-built WebKit engine,





#### PhoneGap Build is a cloud-based service for packaging HTML5 apps for mobile devices

Dreamweaver's Live View also supported these features, along with SVG, @font-face rendering and CSS media queries. The new Multiscreen Preview dialog allowed users to set up responsive designs that change their layout depending on the screen real estate available, which is key to making pages work on both large and small screens (see issue 211, p93).

Dreamweaver CS5.5 also opened up a new authoring field with its ability to create standalone HTML5 apps for handheld devices, thanks to its integration of the industry-leading jQuery Mobile framework, complete with starter layouts to get you going, plus improved DOM support and code-hinting. Most importantly, it integrates with the PhoneGap framework, which, in addition to providing dedicated APIs for accessing device hardware such as accelerometers, cameras and storage, compiles your HTML5 app into native code for the most popular mobile platforms, including Android, Windows Phone and iOS (although you still need to pay, and jump through hoops, to become an Apple developer).

### Creative Suite 6

The latest full Dreamweaver release, CS6, built on these HTML5 foundations, with improved coding support for HTML5 video, enhanced support for jQuery Mobile, and new support for CSS3 transitions (to create smooth animations of object properties without using JavaScript). It also offers a greatly enhanced cloud-based approach to native app creation through integration with Adobe's online PhoneGap Build service. Its use of onscreen QR codes to simplify installing your apps onto test devices is particularly impressive.

CS6 features significant improvements to Dreamweaver's layout and typographic capabilities, again thanks to HTML5. The first is the ability to create "fluid grids" that let you specify different layouts for phone, tablet and desktop devices, with different numbers of columns and different DIV arrangements, with

each grid quickly accessible via icons at the bottom of the Design View window. Also new is the ability to add the scripts necessary to use custom typefaces from Adobe's Edge Web Fonts collection, taking advantage of CSS3's @font-face rule.

Perhaps the most significant new feature of Creative Suite 6 is the introduction of Creative Cloud, a monthly subscription that provides ongoing access to Adobe's full power. This includes not only the major applications, but the services too (for example, the full range of Typekit fonts, not just the open-source Edge fonts). In addition, subscribers get access to new application functions as soon as they're developed – last September, Adobe released Dreamweaver CS6.1 to Creative Cloud customers only.

Dreamweaver's Insert menu and Insert panel have been completely reworked to fit a new HTML5-orientated workflow, with a focus on semantic tags, fluid grid layout DIVs, and a new form-handling approach that, while considerably more complicated, provides access to new controls such as email, URL and search. The biggest change is to Dreamweaver's media handling: Flash animations and video are now downplayed in favour of options to insert



#### Dreamweaver's new HTML5 capabilities are only available to Creative Cloud subscribers

HTML5 video and Edge Animate OAM compositions. A complete reworking of video handling means you can now manage the necessary multiple sources, poster images and Flash fallback from the Property Inspector.

To coincide with this Dreamweaver update, Adobe also announced a number of changes and improvements to its PhoneGap Build service. Its new Hydration capability facilitates faster online compile times, and can automatically push updates to previous installations and notify testers. Crucially, Adobe also took the service out of beta, and, for its official launch, dropped the price to \$10 a month for up to 25 private apps (you can also create one private app and any number of open-source apps for free). Better still, Adobe announced the service would be completely free for Creative Cloud subscribers.

Six months later, there was more good news in the form of another Dreamweaver update: CS6.2, again available only to Creative Cloud members. Surprise, surprise, it's all about updated and improved HTML5 capabilities and workflows, including enhancements to fluid grid handling, and more HTML5 and jQuery form inputs. This time, the biggest change concerns the handling of web fonts: now, when you call up the Manage Fonts dialog, it presents a visual selector through which you can select any of the Edge Web Fonts to make them quickly available inside all your future projects.

Dreamweaver 6.2 also adds direct integration with another Edge service via Adobe Edge Inspect (formerly Shadow). This great utility enables you to preview your site in Google Chrome on your desktop PC and, after installing the relevant apps, on all Apple and Android mobile devices connected via your local network. Once again, Adobe has made a free version available that lets you work with one mobile device at a time, while Creative Cloud subscribers can remotely control and test as many devices as they want simultaneously.

### Terminal decline

The switch to handheld, mobile-based computing and the associated shift to HTML5 has changed the nature of the web, and given new impetus to the idea of design-intensive, hands-on authoring. Dreamweaver has undoubtedly benefited from this, and in many ways it's defining the new standard in terms of hands-on design. However, I can't help thinking it's only a temporary reprieve, and that Dreamweaver remains in terminal decline. In other words, I still think Dreamweaver is dying.

The obvious question is "why?" Partly, it's down to implementation.



Dreamweaver's HTML5 capabilities might be leading-edge, but they're hardly smooth, and the constant changes to workflow suggest Adobe itself isn't sure of the best way to do things. Take video: surely you should be able to simply point at a file and have Dreamweaver convert it into all the necessary formats and insert the code for universal playback? Then there's fluid grid layouts, the handling of which is sort of visual and almost wysiwyg, but not quite. Selecting web fonts visually was a big step forward, but you have to switch in and out of Live View to actually see them in your design. You can't even do this with inserted Edge Animate projects, because Dreamweaver's Live View rendering isn't up to the job – you have to preview them in your browser.

For another reason I think Dreamweaver is in decline, let's go back to that "Create the Web" session. Strangely, its presenter seemed slightly disappointed that so many of us were still using Dreamweaver, and, more tellingly, when he demonstrated Adobe's new support services – PhoneGap Build, Edge Web Fonts and Edge Inspect – he didn't use Dreamweaver to show off the integration. Instead the emphasis was all on Adobe's three new Edge applications – Animate, Code and Reflow – all of which are available for download and are free to Creative Cloud members, including those using the month's free trial.

The first of these applications, Edge Animate, has been around for a while – I looked at in detail earlier this year (*see issue 221, p97*). It's designed for adding dynamic animated content, and it's inevitable that Adobe users will compare it to Flash, which doesn't do it any favours. However, with browser-based Flash on the way out and HTML5 the only universal alternative, Animate represents the future for those of us who want to bring our sites and apps to life. Things are moving fast, and a recent update added visual support for web fonts, and CSS support for gradients and advanced effects such as blurs and colour corrections, radically improving Animate's creative possibilities.

The second new application is Edge Reflow, which, as its name suggests, is designed to enable the creation of responsive designs. The big difference from Dreamweaver's fluid grids is that adaptive layouts are the whole focus of the program, so you can simply resize the design window and click on the ruler to add a new media-query breakpoint and set up your columns, text and graphics accordingly. That's about all it does in this basic preview release, but the potential is clear. Since Reflow shares the same WebKit-based design surface as Animate, it should be well placed to incorporate Edge animations, and take advantage of other HTML5 design features such as wysiwyg web fonts

**News Flash**  
Some rare good news for Flash developers – Microsoft says the Metro version of IE10 will now default to supporting the format. Even so, the future belongs to universal HTML5.



Edge Animate offers an HTML5-based authoring environment for interactive designers

and, eventually, SVG (which will represent a huge leap forward for designers).

Many web developers will now be groaning that Adobe doesn't get the web, and is always trying to foist its print-orientated wysiwyg ways onto a platform that's ultimately built on code. The third application, Edge Code, is designed to allay such fears. In the same way that PhoneGap is based on the open-source Apache Cordova project, Edge Code is based on the open-source Brackets project, a lightweight editor built using HTML, CSS and JavaScript.

It's very early days, but Code already offers a couple of exciting capabilities: the first is its Quick Edit command, which lets you call up associated CSS code directly from your HTML; the second is Live Preview, which creates a live connection between Edge Code and your browser, so that all edits are automatically and instantly reflected with no need for a manual refresh. Currently, Live Preview is limited to Chrome and to CSS edits, but Adobe says it's working on extending it to other browsers, and presumably to Reflow and Animate, as well as HTML and JavaScript.

It's important not to get carried away. In many respects, Edge Animate, Edge Reflow and Edge Code are terribly underpowered, and I'm certainly not suggesting anyone should use them professionally as they stand – Reflow can't even export to HTML. In short, they aren't yet challengers to Dreamweaver. However, the HTML5-based web is changing fast, and, crucially, each Edge application provides the dedicated focus to be able to take full advantage, while

working hand in hand with equally dedicated partners. There's an obvious comparison with Adobe's publishing workflow, where Photoshop caters for bitmaps, Illustrator for vectors and InDesign for layouts; I can imagine Reflow, Animate and Code becoming the web/app tools of choice for graphic designers, interactive designers and developers respectively.

Of course, as the unexpected triumph of HTML5 showed, the future is hard to predict. We can be sure, however, that Adobe won't pull the plug on its own market-leader – and its huge userbase – prematurely. It may well be able to replace Design View with Live View,

**"A time comes when you can achieve more, more easily by starting again from scratch"**

graft in Live Preview and so on, and thus keep Dreamweaver alive and kicking.

Eventually, however, a time comes when you can achieve more, more easily by starting again from scratch, rather than trying to teach an old dinosaur new tricks. The work put into these new Edge apps suggests Adobe has recognised this tipping point is coming for Dreamweaver, and that it wants to be ready to provide Steve Jobs' "great HTML5 tools for the future" when it arrives.

When we look back at this period of huge change in years to come, I think we'll see that the arrival of HTML5 didn't merely signal the death of Flash as we know it, but of Dreamweaver, too. Adobe's users face a doubly turbulent time, but there are plenty of reasons to stay positive. With its Edge tools and services, Adobe is developing an exciting vision for the long-term, post-Flash, post-Dreamweaver, HTML5-based future.



## NETWORKS

# Exploring Europe's biggest tech show

**Steve Cassidy** scours the vast halls of CeBIT, finding some new and exciting trends, and manages to fit his whole IT setup onto a bookshelf

**STEVE CASSIDY**

Steve mixes network technologies with human resources consultancy work. Read his blog at [www.pcpro.co.uk/blogs/stevecassidy](http://www.pcpro.co.uk/blogs/stevecassidy). Email [cassidys@cix.compulink.co.uk](mailto:cassidys@cix.compulink.co.uk)

**W**hen I told various colleagues and contacts I'd be taking up the invitation to visit CeBIT this year, many responded with thinly disguised puzzlement. "What for?" they asked; after all, CeBIT is so vast and logistically challenging, you have to be pretty sure of some substantial benefit before you decide to attend. The only benefits that really matter to those in the regular habit of making such trips involve gaining a substantial degree of inside track with the exhibitors, which in turn means that the process tends to favour big-name brands over tiny start-ups, hardware firms over software firms and so on. It's all about getting yourself exposed to the industry titans.

Thanks to some oddity of the journalistic profession – to which I'm only semi-attached, since a columnist doesn't have to "do news" – very few of my colleagues have ever described

**"The most obvious trend was the number of stands occupied by Chinese hardware makers"**

to me the physical limits that govern what you can actually achieve within a simple trade-show format once it grows to the size of CeBIT. I did some rough calculations: on the first day, I walked eight miles – not to get to the showground, but actually *inside* the showground. On the second day, I made better use of the internal shuttle bus service, while cursing my decision not to bring my excellent



Birdy folding bicycle in the boot of the car. On reflection, though, if even 5% of attendees were to rent some kind of Boris bike or bring their own, the exhibition halls would start to look like Ho Chi Minh City in rush hour.

CeBIT is so vast it fills the city of Hanover's hotels a year in advance. Special trains are laid on just to ferry attendees. Other cities in Lower Saxony, such as Bremen and Brunswick, are

filled up with attendees, too, and yet still people find ways to sneak in. One colleague brings a camper van, despite Hanover in March not being ideal camping weather. The nearby autobahn gets switched to a six-lane, one-way flow, flipping direction at midday.

All that walking – day two wasn't much easier, by the way, since the buses can't actually drive inside the hangar-sized halls – was part of my attempt to take the temperature of the whole industry. In the 1990s, CeBIT was *the* place to catch up with everything your heart and brain could desire to know or see in IT.

Now, even though the size of the show is undiminished, it's only part of a larger picture. The nature of the exhibitors has changed, too; it's far more Germany-orientated than I remember from years past. This doesn't negate its value – the German economy has enough clout to affect the affairs of a whole continent these days – but let's not get dragged into that debate when there are interesting and important technology trends to discuss.

The first and most obvious trend was the number of stands occupied by small Chinese hardware makers. Ever wonder where those crystal-smothered iPhone cases come from, or exactly who KingSpec – star of direct sales to the UK of SSDs for every obscure laptop drive ever invented – is? They were all at CeBIT. As far as I'm concerned, two of the most interesting Chinese stands were those of Huawei and TP-Link.

Huawei makes telecommunications equipment, from tiny USB 3G/4G dongles right up to truck-sized backbone phone system switches and routers. Its stand wasn't among the rabbit-hutch ghettos occupied by compatriots including the Shenzhen Best



Laptop Case Co; no, Huawei's stand was more like the film set for a 1930s Busby Berkeley musical, both in terms of colour and size. Now, I've heard various stories about the ambivalent relationship between Huawei and some of its country-sized, PTT backbone telephony customers. Already, words of caution are being whispered about betting your private and secret communications infrastructure on its platforms; if Huawei turns into the Cisco of the 21st century, I won't be surprised one bit.

TP-Link, on the other hand, is far more friendly and engaging. Maker of lower-end consumer and small-business hubs, routers and switches, TP-Link has put a lot of effort into making its control and configuration software more friendly than the competition, while its pricing is on the implausibly cheap side of reasonable. I've been trying to overcome the fundamental limitations of my concrete house when it comes to Wi-Fi signal paths for years now, and, at the moment, a £78 TP-Link device has taken over this duty from a £250 Linksys unit, with varying results. Don't read too much into this – it's more a review of my house than these WAPs. Granite-chip-reinforced concrete may be great for resisting nearby nuclear airbursts and meteor shockwaves and melting the tips off masonry drill bits, but it's truly dire for wireless communications.

Anyway, back to the TP-Link stand. I had a somewhat "lost in translation" chat with some bouncy, uninhibited Chinese techies and salespeople. The firm is branching out from its traditional, small-plastic-box part of the market and into the metal-cased, rack-mounted world.

They couldn't say much about availability in the UK since, supplying directly from China, they don't track market penetration into every last group of islands off Europe, but if I can find the UK distributor and get my hands on some kit to test, I'll report back here.

Sadly – and for reasons that are probably unworthy and paranoid – any test suite is going to include a nice, long soak-in period connected to a laptop and a network tap, with an install of Wireshark positioned between the TP-Link kit and my internet connection to check for any "conversations" between it and its base in



◉ **CeBIT, the largest IT exhibition in Europe, is held annually in the German city of Hanover**

China. I don't mean to imply that such conversations are always unreasonable to initiate, or that they must automatically be black-hat affairs (whether instigated by outside agents, or from inside the manufacturer). However, it does seem that a high degree of prudence – in the form of some careful monitoring – is the downside of paying such a low price for the smart kit you're tempted by. I'm not singling out TP-Link as the only risk here, before anyone accuses me of "show bias": the last time I had cause to worry along these lines was after a Wireshark run to determine the presence of a remote-control trojan, when one highly suspicious source of a few rogue packets a day turned out to be a FreeNAS install, rather than the crowd of unruly Windows PCs we were all expecting to be the culprits.

Some 10% of the show space was put beyond my reach, possibly for no better reason than convention officiousness. For example, Planet Reseller was guarded by uniformed heavies, and many of the more familiar brands in the UK could be glimpsed over their epauletted shoulders and past their shaking heads. Planet Reseller is a pretty good reflection of the sometimes murky nature of agreements

between manufacturers and vendors, so, after noting the bad reaction to my press pass, I walked about a mile and a half through the exhibition grounds and entered the business-computing hall.

Here were stands that looked as if they'd been designed inside Second Life, whole ecosystems and corporate styles that,

## "The IBM stand at CeBIT was the size of an entire hall at Olympia in west London"

intentionally or otherwise, revealed much about the businesses they were built to represent. The SAP stand, for example, was marvellously comforting and welcoming on the inside, despite featuring a 50-metre blank wall on one side (possibly the world's most expensive temporary dark alley).

The IBM stand was more open, and much larger than any other I could find: approximately the size of an entire hall at Olympia in west London. There was plenty there to get my juices going, especially the IBM version of a gamer's LED-lit PC case: an enterprise-scale mainframe with Perspex sides, a watercooling stage (optional, said the labels), and some fat rubber pipes with expensive chrome fittings. This is enterprise-grade computing meets *Custom PC*: shiny cases, LEDs lighting up the cooling ducts and PCBs, and little labels to indicate what each part of the architecture contributes to the whole. I suspect that merely learning how the devices on IBM's stand are connected together, and to the internet, would be a worthwhile case study in heavy-metal networking by itself.





## Small but mighty

The trend that really caught my eye wasn't in the big business halls, however, but rather back in the cramped Far East importer stalls. Fiddling around at home with the HP MicroServer (see *Data centre on a bookshelf*, below) got me thinking about the bizarre evolutionary twists that have brought us to the server and networking world of 2013.

In particular, everyone assumes one powerful incentive of "going cloudy" is that servers are now overwhelmingly rack-mounted: power-hungry, noisy, demanding of cooling, and awkward to set up and configure. Half of the hassle of running your own servers in a small business is that you need a rack-friendly room to house them.

So, while chatting with Boston (the UK importer of the Supermicro server range), I was surprised to find a tiny cube-shaped box being presented by Supermicro subsidiary Ablecom ([www.pcpro.co.uk/links/225nt1](http://www.pcpro.co.uk/links/225nt1)). Closely resembling a NAS device, and the HP MicroServer, this bit of bent metal has a slot in the bottom for a microATX motherboard and can take any size of CPU, from the humblest Atom to the chunkiest i7, along with four 3.5in disk drives. It isn't a noisy rack-mount, nor is it hard to work on, nor especially expensive. Bearing in mind the experiments I've been conducting at home, could the most important headline to emerge from my CeBIT visit be that the days of rack-mount hardware for small businesses are coming to a close?

## Data centre on a bookshelf

You can't see the most fun part of my HP MicroServer (see *above right*), since my camera's macro mode isn't up to taking a picture of its small, plastic sumo wrestler novelty USB key, which plays a pivotal role in my "data centre on a bookshelf" concept. The MicroServer has a remarkable following in the virtualisation world, very separate from its other followers, who are principally fiddling with the Home versions of Windows Server and the like. What attracts these virtualisation gurus is that, despite a paper specification that's light years away from the kind of heavy metal they're used to, the MicroServer is both entirely VMware vSphere-capable, cheap, and even quite expandable. Ignore the AMD II Neo processor name: this box can take 8GB of RAM, and even has two PCI Express expansion slots, as well as the internal USB socket that hosts my sumo USB key. vSphere Hypervisor

boots from USB SSD, and, when I was building this machine, the first empty USB key to hand was sumo boy, so in he went, and there he stays.

My first home hypervisor box isn't in the picture, because it's a traditional desktop-sized, workstation-grade PC – an HP xw6400. This has been running VMware ESXi so reliably that I can't remember what I did with the keyboard, mouse or monitor that used to be attached: I only ever ran up the MicroServer to see what all the fuss was about, fully expecting its weedy little CPU to fare badly when compared with the dual-socket wonder of the 6400. But ten minutes after watching the vSphere Client log into the MicroServer, I was hooked. There's something about the AMD Neo architecture, when combined with vSphere, that makes it punch very far above its supposed weight. On the xw6400 with four cores, vSphere reports the total gigahertz available of two, those being the rating of each core running in parallel. On the MicroServer it reports 3GHz, that being the aggregated total of the cores in the Neo, which is reported as being 2 x 1.5GHz. Confused? Me too.

The bottom line was that the MicroServer performs so much better than my old xw6400 workstation that it was an immediate no-brainer to shift all my VMs over to it. I found it a compatible low-profile PCI Express Gigabit Ethernet card, so the guest VMs can be housed on an iSCSI resource somewhere on the LAN without the VM traffic and the storage traffic banging heads. To my amazement, there's also an eSATA port, so as soon as I can clear it off I'll be repurposing the Promise four-drive eSATA enclosure to run as plain, ordinary disks for a NAS VM.

Given that the core starting piece of this puzzle, the MicroServer, can be had for as little as £160 secondhand (and allegedly for only £174 new, at the time of writing), it's

worth standing back to figure out just how much heavy rack-mount kit you could replace with the selection of small boxes I've fitted into a bookshelf-sized corner of my basement. There's the MicroServer itself, of course: only two cores, but they run very fast, and VMware has been saying for some time that the VM count isn't core-dependent any more. Then there's a variety of



My "data centre on a bookshelf" delivers almost 20TB of disk space, for a tiny energy demand, in a small space

assorted external storage resources, from my Netgear ReadyNAS RND4000 to the Promise DS4600, by way of a couple of Iomega ix2-200s. I snaffled the Iomegas and the Netgear because they combine basic (which is to say, frequently annoying) NAS capabilities with much smarter and more flexible (but harder to set up) iSCSI target capabilities. Laying down that pile of little boxes and counting all their disk slots, partition formats, RAID configurations and connections, I can deliver almost 20TB of disk space, with a sensible four or five VMs, for an overall measured energy demand lower than the single old-school CRT tube monitor that I used to have plugged into the same mains plug bar.

Of course, the key question is how does this pile perform with a representative multi-user load on the network? My experience has been that NAS devices in particular may look great in single-user testing and then be unspeakably dire once multiple users connect. iSCSI helps with this, mainly because the initiator/target pair have much more memory and CPU grunt between them than the built-in Windows SMB network client stack. Putting more than one network card into the hypervisor server is the next trick: I find that even the smallest CPU can punch far above its weight when helped out by enough well-specified peripheral controllers (be those network, storage or graphics).

This bookshelf setup is a bit of a relief for me, not because I have a long-held resentment against sharp-cornered, heavy-metal, enterprise-level rack-mounted servers, but more because it allows me to keep my own office functions running, with more than enough capacity for the very worst case data recovery, virtualisation or rationalisation project, while freeing up my four or five heavy-metal boxes for use on new software releases, testing and server rescue activities. It's also acted as a handy mental recalibration exercise concerning the difference between old and new, at the end of which it looks like I have an xw6400 for sale...

### Aerial view

Zoom all the way out to an aerial view of the Hannover Messe from about 4km up. That's about the altitude you'll need to encompass the whole show. If you were now to take a photo, turn it to greyscale, and take some multicoloured markers and start scribbling over the resulting print with national colours, then I'd judge from the experience of my exhausting walks that while the Chinese made up probably 30-40% of the roster of business attendees, they only represented about 20% of the surface area.



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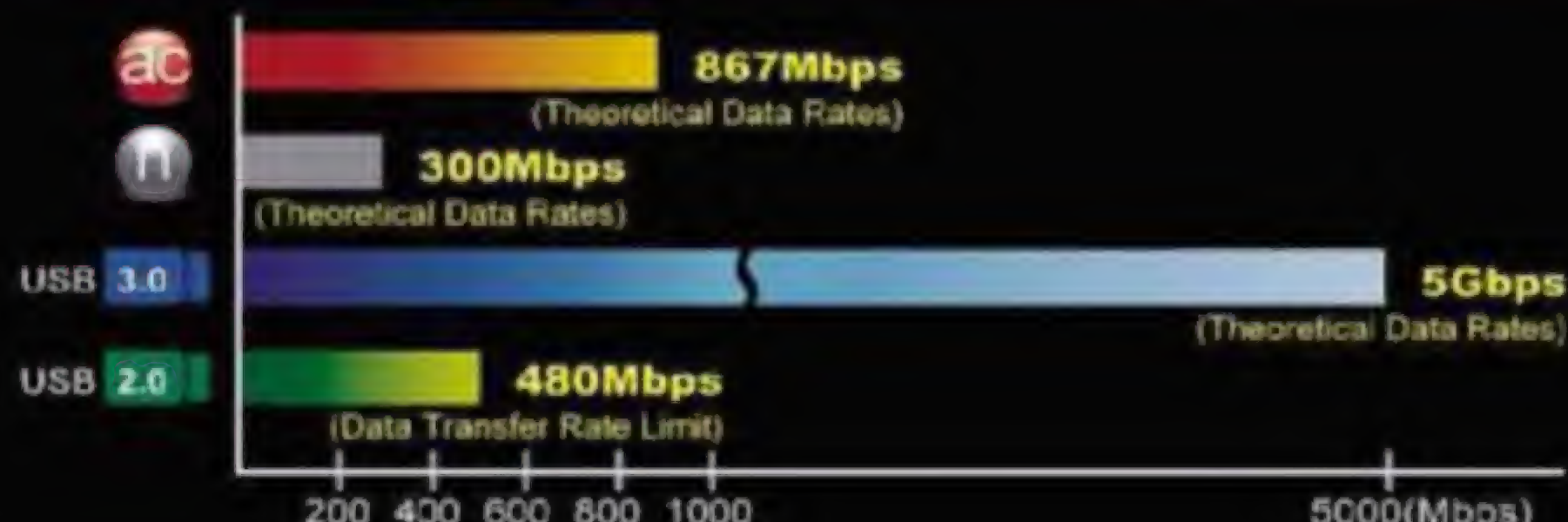


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# REVIEWS | LABS

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## JONATHAN BRAY wants freedom from the tyranny of local storage

**A** few years back, I'd finally reached a state of hardware nirvana. My PC was faster than I'd envisage any application needing it to be, I had a big, beautiful monitor, and more storage space than I knew what to do with.

At that time – I forget what year (my memory isn't what it used to be) – I had nothing that was ever likely to stretch the limits of my 540GB, mechanical hard disk. Even encoding most of my CD library in the lossless FLAC format barely made a dent.

Now, though, everything has changed. My PC is gathering dust in the garden office, and I've long since made the switch to doing everything on a laptop. This has largely been a positive move: the laptop takes up far less room, which is a plus on the marital relations front; its Core i5 processor is powerful enough to do anything I ask of it, from editing high-resolution raw photos for blog posts, to editing 1080p holiday videos; and the 320GB SSD is a dream, booting into Windows 7 in seconds, launching hefty applications in a heartbeat, and generally going about its business with quiet efficiency.

The one big drawback has been the loss in storage space that moving to an SSD has incurred. This might not have been an issue back in the days of endless plenty, but now that I'm the proud owner of a modern DSLR that spits out high-resolution raw files at 27MB a pop, I'm constantly maxing out the hard disk on my laptop.

The frequency with which this happens is partly due to laziness – I really ought to be more ruthless with that Delete key – and partly as a result of my preponderance for shooting more frames than I need. Either way, every time it happens my heart sinks. The business of clearing out little-used applications, video and photo files is only matched in tedium by the tidying of toys from a five-year-old's bedroom floor; you know you're going to have to do it again much sooner than you'd like.

Why is this happening? In an age where it's possible to offload gigabytes of data to cloud storage services such as Dropbox, and so much information and computing power is accessible online, the ball and chain of local storage should be a fading memory, not an ever-present annoyance.

The simple answer is a lack of network speed, a fact in part proved this month by

Adobe's continuing refusal to build network support into the latest edition of Photoshop Lightroom 5 (*see p124*). The ability to keep raw originals stored on a NAS drive and high-resolution previews on your local PC would solve my problem (and, I'm sure many others'), especially now that Adobe has introduced its Smart Previews feature, which allows your edits to be made on previews stored locally, which are later applied to the originals stored on an external drive. But, although it's possible to work around the issue using drive mapping, you still can't simply point Lightroom at a shared network folder and let it manage the process for you. It's clear Adobe simply doesn't want the bother of supporting users with sluggish, flaky home networks.

The underwhelming performance of the 802.11ac routers in our wireless routers Labs (*see p138*) only serves to underline this problem. Despite the new standard, there's still no immediate prospect of a great leap forward in wireless performance. It would take a monumental effort for everyone in the

**The ball and chain of local storage should be a fading memory, not an ever-present annoyance**

industry to adopt it; and even then we'd likely be in the same boat as we are now, with congestion hampering our ability to use its full capacity.

This is a problem that isn't going to go away. Still image resolution in consumer cameras shows no sign of arresting its upward trend, and before you know it your home movies will be occupying even bigger tranches of storage space than they do right now, as devices gain 2.7K and 4K capabilities. This isn't such a far-fetched idea – check out this month's review of the tiny GoPro Hero3 (*see p121*) if you don't believe me.

To put it simply, as long as the pressure on storage continues – and as long as wireless networking continues to lag so far behind wired connections – big hard disks and SSDs are here to stay. Alas, this also means there's no end in sight to the regular, tortuous task of hard disk clearance. It looks like I'll just have to start saving those pennies for a larger SSD.



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**JONATHAN BRAY** is PC Pro's reviews editor. He wonders if the problem, really, is because he's a bit of a hoarder.

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**Email:** [jonb@pcpro.co.uk](mailto:jonb@pcpro.co.uk)





Photography: main intro and cutouts, Julian Velasquez



# Asus Fonepad

A compact tablet boasting 3G connectivity and phone features for a ludicrously low asking price, combined with excellent battery life, acceptable performance and a decent screen

PRICE £150 (£180 inc VAT)  
SUPPLIER [www.amazon.co.uk](http://www.amazon.co.uk)

**T**he Asus Fonepad is a curious mix of devices: it's a 7in tablet with 3G, but it's also a fully fledged smartphone, complete with an integrated earpiece and microphone, so you can go all Dom Joly making phone calls on the bus home.

In reality, the chief appeal of the Fonepad, aside from providing a talking point down the pub, is its exceedingly good value. It will set you back only £180 inc VAT, and when you think about what

you're getting for the money – a smartphone and a 7in 3G tablet similar to the Nexus 7 (web ID: 379261) in one package – it's a remarkable budget buy.

## Fonepad vs Nexus 7

The physical similarity between the Fonepad and the Nexus 7 is striking, and perhaps shouldn't be all that surprising, given that the two tablets are made by the same company. The screen surround is the same width, the

screen is the same resolution (800 x 1,280) and size – giving a pixel density of 216ppi – and it employs the same IPS technology, too. In the UK, the Fonepad is available with only a front-facing 1.2-megapixel camera – just like the Nexus 7.

However, there are big differences between the two tablets elsewhere. Take the rear panel: the Fonepad is made of smooth, matte plastic, where the Nexus 7 is textured and rubbery, and the Fonepad has a

pop-off panel at the top for access to the tablet's SIM and microSD card slots. The Nexus 7 has no way of expanding storage; the Fonepad can accommodate another 32GB in addition to its internal 16GB (or 32GB).

The other big difference lies inside the Fonepad: it sports a single-core, Hyper-Threaded 1.2GHz Intel Atom Z2420 CPU and 1GB of RAM instead of the quad-core, 1.3GHz Nvidia Tegra 3 of the Nexus 7. Despite the discrepancy in the number of



## KEY SPECS

Single-core 1.2GHz Intel Atom Z2420 CPU • 1GB RAM • 16GB storage • microSD slot • 7in 800 x 1,280 IPS LCD • 802.11bgn Wi-Fi • 4,270mAh Li-ion battery • Android 4.1.2 • 1yr RTB warranty • 120 x 10 x 196mm (WDH) • 340g

The Asus Fonepad is relatively chunky



cores, performance is comparable. In the stock Android browser, we recorded a score of 1,240ms in the SunSpider test, and it achieved a mid-range 2,935 in Quadrant. The Nexus 7 was actually slower in the single-threaded SunSpider test (1,683ms), but surpassed the Fonepad in the more demanding Quadrant, with a score of 3,687.

In general use, the Fonepad is fluid and responsive. Swiping from homescreen to homescreen, panning and scrolling was a pleasant experience, and it handled all the demanding games we threw at it, from Modern Combat 3: Fallen Nation to Real Racing 3.

### Stamina and screen

With a huge 4,270mAh battery onboard, it's no surprise that battery life is excellent. We ran the same tests we run on all smartphones, with 3G on and Wi-Fi off, and, after a day of syncing Gmail, downloading 50MB of data, 30 minutes of phone calls, an hour of screen-on time and an hour of audio playback, the Fonepad had 80% capacity remaining on the gauge. That's right up there with the very best smartphones; in the video looping test we run on all tablets, with flight mode on, its result of 12hrs 58mins is the best we've seen from a tablet of its size.

Even the screen quality is good. At maximum brightness, we measured it at 316cd/m<sup>2</sup> – only a fraction less than the Nexus 7's 330cd/m<sup>2</sup>. Colour reproduction is

a touch less vibrant than the best compact tablets, but our only major complaint is that the glass on the front picks up greasy fingerprints too easily, hindering readability outdoors.

### Your next Fone?

Technically, the Fonepad is a perfectly adequate smartphone. We had no complaints about call quality, although the quiet speaker on the bottom edge means it isn't ideal as a speakerphone. Since it uses a near-stock Android 4.1.2, there's very little wrong with the dialler or the contact-management side of things, either.

The Fonepad has its fair share of limitations, however. It's far too broad to be comfortably used in one hand, and the matte rear of the device is slippery, making it difficult to hold it one hand securely. We're not happy about the lack of Gorilla Glass on the front, either. You'll have to take care; it will quickly pick up scrapes and scratches, especially if you use it as your main communications device.

Its size means it simply isn't as practical to keep on or around you as a smaller device. In the car, you can't simply drop it into any old cubbyhole, and if you pop out to the shops for a sandwich, you'll need to be wearing a coat with extremely large pockets if you want to take it with you.

Still, for those who make only the occasional voice call, and don't mind using a Bluetooth headset and leaving the Fonepad in a bag, it could make a ready replacement for phone and tablet. In fact, even if you choose not to take advantage of the calls capability, the 3G data modem is well worth having.

◉ A small panel at the rear covers the SIM and microSD slots



◉ The Fonepad runs Android 4.1, with only a few small changes

### Software

As we've already mentioned, the Fonepad runs a version of Android 4.1.2 that's very close to stock. However, Asus has tweaked it a little here and there.

The most significant of these alterations is the introduction of a selection of mini, pop-up apps, which appear in a row along the bottom of the screen when you tap the small arrow in the bottom-right corner. There are 12 apps in total, including a stopwatch utility, sticky notes, a to-do list and even a compact web browser and video player. It's possible to run all these apps simultaneously, as if on a very small Windows desktop, although things become cluttered very quickly.

Elsewhere, the changes are limited to bundled apps, which, as has become customary with Asus tablets, are numerous. Asus Story provides a means for compiling photo albums, complete with animated page-turns; App Backup allows you to take snapshots of apps and their data in case you need to reinstall; and the handy App Locker utility allows you to password-protect certain apps and files – a godsend if you're

sharing the tablet with young children. There's also a "lite" version of Asus' excellent note-taking software, SuperNote; video editing in the shape of Movie Editor; and, if the excellent battery life just isn't enough, a power-management tool that, among other things, allows you to set the tablet to adjust the screen brightness according to the app you're using.

### Verdict

The Asus Fonepad has weaknesses, not least the fact you'll have to wait on Asus for OS updates – with the Nexus 7, you get the latest version of Android as soon as it's released. It isn't very practical to use as an everyday smartphone, either. But, even if you think the phone capabilities are frivolous, there's no denying the Fonepad packs a hell of a punch for a budget tablet. Indeed, it's good enough to elbow the iPad mini off our A-List. **JONATHAN BRAY**

<b>OVERALL</b>	★★★★★
<b>PERFORMANCE</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★




**PREVIEW**

# Samsung Galaxy S4

An impressive piece of engineering: powerful, innovative and – despite having a larger screen than its predecessor – still pocketable

**PRICE** £441 (£529 inc VAT);  
from free on a 31/mth,  
24mth contract  
**SUPPLIER** [www.carphonewarehouse.com](http://www.carphonewarehouse.com)

**T**he Samsung Galaxy S4 is probably this year's most anticipated smartphone, but after its glitzy New York launch in March, Samsung has taken its time getting the handset to market. Alas, this delay meant our official review sample hadn't arrived at the time of publication, although the phone will be in shops by the time you read this.

We did have the chance to get hands-on with the phone at an

event in London, however, and our first impressions are that it's going to give the current king of smartphones – the HTC One (web ID: 380965) – a run for its money.

This is apparent from the first time you hold it. Despite sporting a 5in Full HD display, the S4 is slightly slimmer and lighter than the 4.8in S III. If you don't believe us, take a look at the three images opposite, which show the two phones side by side.

From the front, it's tricky to tell the two apart, with the only apparent difference being the marginally taller screen, a smaller bottom "lip", and a rearrangement of the sensors above the display. Look closely and you'll notice one

extra black dot. That's an infrared sensor, which the S4 uses to power its gesture-control feature (more on this later).

What isn't apparent from the photographs is how the S4 feels in the hand; the difference between this and its predecessor is palpable when holding it. The S4 feels more compact and pocketable – a remarkable feat of design given its larger, Full HD display.

The sharpness and immediacy of that display is something else that can't be fully appreciated from our photos. The Samsung Galaxy S III's screen is still one of the best around, but the S4 edges in front in terms of quality. It almost feels as if you can reach

**First impressions of the Galaxy S4 are promising: both power and battery life have increased**

out and touch the pixels, and the glass layer on top of the S4's Super AMOLED panel feels as if it's hardly there.

Flip over the Samsung Galaxy S4, and the differences are more pronounced. It's still plastic at the back – and in this respect lags behind the HTC One, whose chassis is milled from luxurious aluminium – but the fine diamond pattern and cleaner white colouring of the S4 makes it more attractive than its predecessor.

Beneath that plastic rear panel, and squeezed into the S4's ultra-svelte chassis, is a higher capacity battery: 2,600mAh versus the 2,100mAh of the S III. And although the new screen is bigger, and sports many more pixels, Samsung claims it consumes 23% less power than the old model. This should lead to a welcome improvement in battery life, which we'll report on when we carry out our full review.

## Performance

European S4 handsets won't feature the 1.6GHz octa-core processor touted at the launch event; instead, our handsets will sport a 1.9GHz quad-core Qualcomm Snapdragon. This may sound disappointing, but since half of the eight cores in the more exotic version of the S4 are low-power ones aimed at saving battery life, performance should still be good.

There was certainly no lack of sprightliness on the handset we tested. As we've come to expect from top-end Android smartphones, menus and web pages scrolled smoothly. In the SunSpider JavaScript browser benchmark, the S4 put in a stupendously quick performance, completing the test in 892ms, compared to the S III's 1,280ms.

## Smart features

As expected, the Samsung Galaxy S4 runs the latest version of Android (Jelly Bean 4.2.2), with a heavy dose of Samsung tweaks, courtesy of its TouchWiz UI. The most interesting of these are the





◉ **The S4's camera boasts 13-megapixel capture – even more impressive than that of the S III – and a host of new features**

new “touchless” features. This is where the new infrared sensor on the front comes into play, allowing you to answer the phone by waving your hand in front of the screen, to scroll through photos in the gallery or skip music tracks without touching the screen.

We weren't able to test the phone part, but we successfully managed to swipe through a selection of pictures – although this isn't quite the intuitive process you might expect; we had to ensure our hand passed directly in front of the sensor to make it work.

We're also indifferent about Air View, another touchless interface feature that takes advantage of the super-sensitive touchscreen to sense your finger when it's hovering above it. The idea is to provide a quick preview of messages and expanded image thumbnails; in practice, we found it uncomfortable to use. You have to get your finger very close to the screen, and the previews don't appear instantaneously. If that all sounds a bit too gimmicky, the hyper-sensitive touchscreen does have one further, more practical application: as with Nokia's Windows Phone 8 handsets, it can be operated while wearing gloves.

#### KEY SPECS

Quad-core 1.9GHz Qualcomm Snapdragon CPU • 2GB RAM • 16/32/64GB storage • 5in 1,080 x 1,920 Super AMOLED display • quad-band GSM/GPRS/EDGE/3G/HSDPA/4G • Bluetooth 4 • 802.11abgn+ac Wi-Fi • 13MP stills • 1080p video • GPS • FM radio • 2,600mAh Li-ion battery • Android 4.2.2 • 1yr RTB warranty • 70 x 7.9 x 137mm (WDH) • 132g

The Samsung Galaxy S4 delivers an extension of the Smart Stay features we first saw on the S III. Now, as well as keeping the display on while you're looking at the screen, the S4 will also pause video automatically when you look away. This worked when we tried it – but again, it feels gimmicky.

We also gave the new S Translator feature a whirl. Designed to help the linguistically challenged to communicate abroad, it can translate text between ten different languages, including English, German, French and Spanish. Its party trick is the ability to convert the spoken word into another language via the phone's voice-recognition engine. We found this was hit and miss, though, working only once in five attempts, and providing only the most literal of translations.

#### Camera

One of the major attractions of the S III was the quality of its camera, and the S4 moves this on a notch, with a 13-megapixel sensor and a host of interesting new features.

There's Dual Shot, which uses both rear- and front-facing cameras to shoot simultaneously and combine the two images in a montage. Sound & Shot allows nine seconds of audio to be recorded to accompany photos, while Drama Shot captures a series of images and superimposes them on top of each other, resulting in a collage action shot.

We suspect these features will be little-used novelties, but the



◉ **The S4 is narrower, slimmer and lighter than the Galaxy S III, yet the screen is marginally longer than its predecessor**

quality of the camera output initially looks good. We took several snaps at the event, and studied them in detail the following day. Even under low light, our photos exhibited impressive detail and balanced colour reproduction.

#### Initial verdict

We came away impressed from our first encounter with the S4, and that's principally down to the

discreet improvements to the phone's design. It isn't that the Samsung Galaxy S4 is a thing of beauty; it's nowhere near as compelling as the silky aluminium chassis of the HTC One, and it feels cheaper than an iPhone 5. But by upping both the screen and battery size, and shrinking the chassis, Samsung has achieved something extraordinary. Now, we wait to see how it performs in next month's Labs. **JONATHAN BRAY**



# Lenovo ThinkPad Tablet 2

Lenovo's first Atom-powered Windows 8 tablet isn't good enough to depose the Dell Latitude 10

**PRICE** £583 (£699 inc VAT)  
**SUPPLIER** [www.lenovo.co.uk](http://www.lenovo.co.uk)

**L**enovo is no stranger to making business tablets, but its latest creation, the ThinkPad Tablet 2, is its first attempt at a serious-minded 10.1in Windows slate. With an IPS screen, an integrated stylus and an Intel Atom CPU promising all-day battery life, it could be the tablet your briefcase has been waiting for.

Lenovo has done well to imbue the Tablet 2 with a little of the classic ThinkPad identity. The rear is covered in smooth, soft-touch, matte-black plastic – the familiar uniform of the ThinkPad – and the red cap of the stylus mimics the bright red of the trackpoint on Lenovo's business laptops. It's light, too, weighing only 568g.

Build quality isn't the match of the best ThinkPads, however: there's some give in the rear panel, and the chassis has a little side-to-side flex. That said, it feels tough enough to survive life in and out of the office. Our review unit withstood a couple of (accidental) drops onto thin office carpet tiles, soldiering on as if nothing had happened.

The Lenovo's 10.1in 1,366 x 768 IPS screen does its job well. Brightness reaches a maximum of 322cd/m<sup>2</sup>, which is ample for most

situations, and the panel's contrast ratio of 657:1 makes for solid, punchy image quality, with rich, bold colours. The one slight irritation is the position of the automatic brightness sensor: we found the sensor was occasionally obstructed by our thumb when we held the tablet in landscape mode, which caused the screen to dim.

Inside the chassis, an Intel Atom CPU keeps Windows 8 Pro 32-bit ticking over. The processor is a dual-core 1.8GHz Atom Z2760, and it's backed by 2GB of RAM and 64GB of solid-state storage. It isn't a lightning-quick combination, as the Lenovo's overall score of 0.17 in our Real World Benchmarks demonstrates, but as long as you don't tax it with heavyweight applications it works well. It responds instantly to every pinch, flick and edge-swipe, and the Start screen zooms into view without pause for thought.

The Tablet 2 stylus slots securely into the tablet's top edge when not in use. A button on the stylus' edge provides right-click support, and, while it's a little small for large hands, we found it worked well with Windows' handwriting support, and Word and OneNote. Scribbling in Fresh Paint wasn't quite so successful, however. Although Lenovo claims the digitiser recognises 1,024 pressure levels, it didn't feel particularly sensitive.

Unlike the Dell Latitude 10 (web ID: 380869), the Lenovo doesn't accommodate a removable battery. Instead, the Tablet 2 uses a sealed 30Wh lithium-ion cell, which lasted 11hrs 46mins in our light-use battery test. Charging is rather slow via the micro-USB AC adapter, however, and the device refused to charge with certain micro-USB cables.

**The integrated stylus slots neatly in the top edge of the Tablet 2**



**The Tablet 2 is similar in design to Lenovo's business laptops**

Several optional extras are available, including a docking station (£81 inc VAT) that doubles as a desk stand and provides two USB 2 ports, full-sized HDMI, 10/100 Ethernet and 3.5mm audio input and output. It also allows the tablet's battery to be charged more quickly, thanks to the supplied laptop-style power supply. A docking keyboard isn't available, but Lenovo offers a compact Bluetooth model with an integrated stand, which has its own optical touchpoint. It's shockingly expensive, though, at £133. A selection of cases and bags are also available, and a DC-to-USB adapter allows the Tablet 2 to charge from a car cigarette lighter.

Connectivity is ample. Two flaps along the Lenovo's edges reveal a SIM slot, microSD slot (which accepts cards up to 32GB) and a full-sized USB socket. There's a 3.5mm headset output, and a mini-HDMI output is positioned on the tablet's base, alongside a proprietary docking connector. If you can make do with only dual-band 802.11n Wi-Fi and Bluetooth 4, you can save cash by opting for the basic

£570 model; if mobile broadband is essential, the £699 model adds an unlocked Ericsson C5621 3G modem. NFC support is available for an extra £11.

The front- and rear-facing cameras are fine for business purposes. While images from the front-facing 2.1-megapixel snapper are a little grainy and lack fine detail, they're fine for videoconferencing, and the dual integrated microphones keep speech clear and intelligible. The rear-facing 8-megapixel unit is supported by an LED flash and offers a significant step up in quality, capturing more detailed shots and acceptable 1080p video clips. Only the speakers are disappointing; there's a lot of distortion at top volume.

Lenovo may have created a product with the looks of a top-class ThinkPad, but we're not convinced it's good enough to clinch our business tablet top spot. It's sleek and attractive, and the docking stylus is a boon, but, with the Dell Latitude 10 delivering a brighter screen, and offering the flexibility of a replaceable battery, the ThinkPad Tablet 2 doesn't quite have what it takes. **SASHA MULLER**

## BATTERY: HEAVY USE 4hrs 32mins

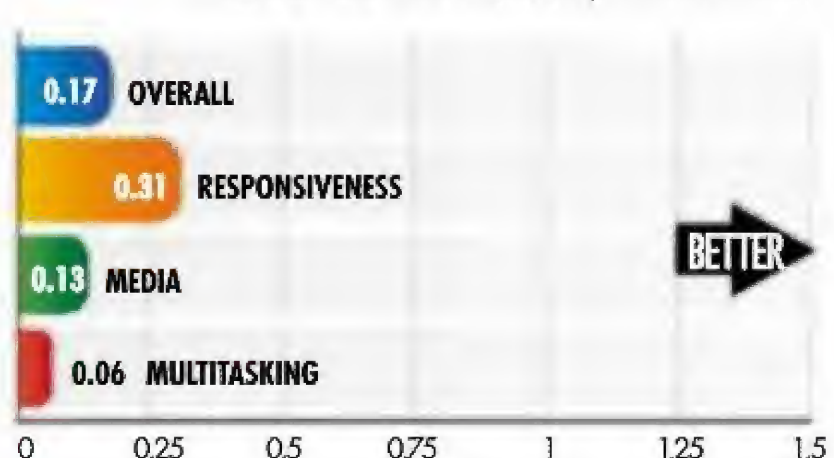


## BATTERY: LIGHT USE 11hrs 46mins



## REAL WORLD BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



## KEY SPECS

1.8GHz dual-core Intel Atom Z2760 • 2GB DDR2 RAM • 64GB SSD • 10.1in 1,366 x 768 display • mini-HDMI • USB 2 • microSD • dual-band 802.11n Wi-Fi • Bluetooth 4 • 3G • 8MP rear/2MP front cameras • Windows 8 Pro 32-bit • 1yr RTB warranty • 263 x 10 x 165mm (WDH) • 568g

OVERALL	★★★★★
PERFORMANCE	★★★☆☆
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★★





# Samsung Series 9 900X3D

A fantastic Ultrabook that boasts superb build quality and a balanced specification at an appealing price

» **PRICE** £695 (£834 inc VAT)

» **SUPPLIER** [www.saveonlaptops.co.uk](http://www.saveonlaptops.co.uk)

**W**hen Samsung's Series 9 arrived on the scene, it was a revelation. Combining outstanding build quality with a svelte, millimetre-perfect figure, it had only one weakness: its price. Now, the Korean manufacturer has revisited its premium Ultrabook, trimmed the specification and cut the price to only £834 inc VAT.

Visually, Samsung hasn't changed a thing, and with good reason: the Series 9 remains one of the swankiest laptops money can buy. The main alteration is the colour: the previous model we reviewed came in a dark, lustrous blue; the Series 9 900X3D is finished in sparkly, matte silver.

Squint and you could mistake it for an Apple MacBook Air (web ID: 375160), but the Series 9 has a look of its own. Unlike the Dell XPS 13 (web ID: 380956), which grabs attention via flashy carbon fibre and shiny chamfered edges, its smooth curves and simple lines create a more understated figure.

It's beautifully constructed, too. Despite weighing only 1.11kg, it feels rock-solid throughout. The lid is only 4mm thick, yet barely moves when you try to yank it to and fro, and we almost hurt

our wrists trying to find any give in the base. No other Ultrabook, the MacBook Air included, can match the standard of its build.

The Series 9 oozes quality. The keyboard backlight smoothly comes to life when the lights go down, and, while we'd like more feedback from the short-travel keys, the spacious, Scrabble-tile layout and grippy, matte keycaps make amends. The glass touchpad is top class: Windows 8's edge-swipe gestures feel slick and activate reliably; zooming, pinching and two-fingered clicks all work with zero effort.

Pushing such refined design below the £1,000 mark clearly hasn't been easy, and the main compromise is performance. Samsung has, in fact, downgraded the CPU from the last model to a 1.4GHz Core i5-2537M, and, with 4GB of RAM and a 128GB SSD, the 900X3D is anything but top of the range. Its overall score of 0.52 in our Real World Benchmarks is a long way behind the XPS 13's 0.73.

Also, due to the 32nm Sandy Bridge CPU, the Series 9's metal case heats up considerably when you start to push it with games or strenuous applications.

Battery life isn't up with the best. The 7hrs 22mins in light



❶ The Series 9 900X3D betters even the MacBook Air for build quality

use is a slight improvement on the last model, but it's a shame Samsung couldn't find the budget for a more power-efficient Ivy Bridge CPU.

While the 1,600 x 900 display on the previous Series 9 was the cream of the Ultrabook crop, the competition has caught up. With a maximum brightness of 420cd/m<sup>2</sup>, a contrast ratio of 736:1 and an anti-reflective, matte screen finish, it remains crisp and legible, even outdoors, but it's no longer the best on the market.

Images have plenty of punch, but highlights are blown out and the 7,206K colour temperature lends colours a cold, unnatural tone. Colour accuracy isn't a strong point, either: the average

Delta E of 6 is far behind the 3 scored by the XPS 13.

Connectivity remains minimal. The tapered edges look great, but there's room for only one USB 2 port and one USB 3 port. A tiny proprietary port provides Gigabit Ethernet connectivity via the supplied adapter, but the micro-HDMI and mini-VGA outputs mean you'll probably need to shell out for new cables if you want to connect to a monitor. Still, the presence of dual-band 802.11n Wi-Fi and Bluetooth 4 is welcome.

Much has changed since the Series 9 emerged a year ago. The competition is much stiffer, and the 1,600 x 900 display now looks average compared to the Full HD display of the Dell XPS 13. But, for only £834, the Series 9 900X3D gets the essentials spot on. With gorgeous looks, great build and superb ergonomics, it's more than worthy of a Recommended award. **SASHA MULLER**

**BATTERY: HEAVY USE** 2hrs 48mins

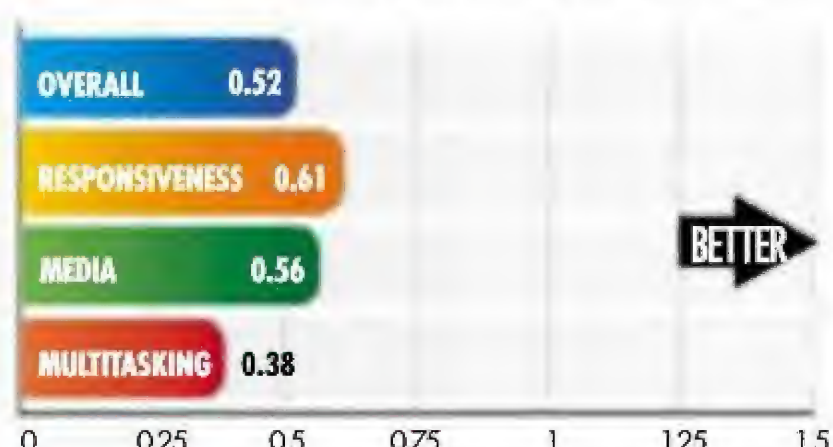


**BATTERY: LIGHT USE** 7hrs 22mins



## REAL WORLD BENCHMARKS

3.4GHz Intel Core i7-2600K, 4GB DDR3 = 1



## KEY SPECS

1.4GHz Intel Core i5-2537M • 4GB DDR3 RAM • 128GB SSD • 13.3in 1,600 x 900 display • dual-band 802.11abgn Wi-Fi • 1 x USB 3 • 1 x USB 2 • micro-HDMI • micro-VGA • 10/100 Ethernet (via supplied adapter) • Windows 8 64-bit • 1yr C&R warranty • 314 x 219 x 13mm (WDH) • 1.11kg (1.43kg with charger)

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★



# Scan 3XS Z77 Node Titan

Titanic gaming power in a tiny package, matched by an equally huge and unpalatable price tag

PRICE £1,767 (£2,121 inc VAT)  
SUPPLIER [www.scan.co.uk](http://www.scan.co.uk)

**W**e're all for high-end PCs that push hardware boundaries, so we salivated when the Scan 3XS Z77 Node Titan turned up in the labs. It's built around the Nvidia GeForce GTX Titan, which is the world's most powerful single-core graphics card – and the most expensive, too, costing a mighty £800 inc VAT.

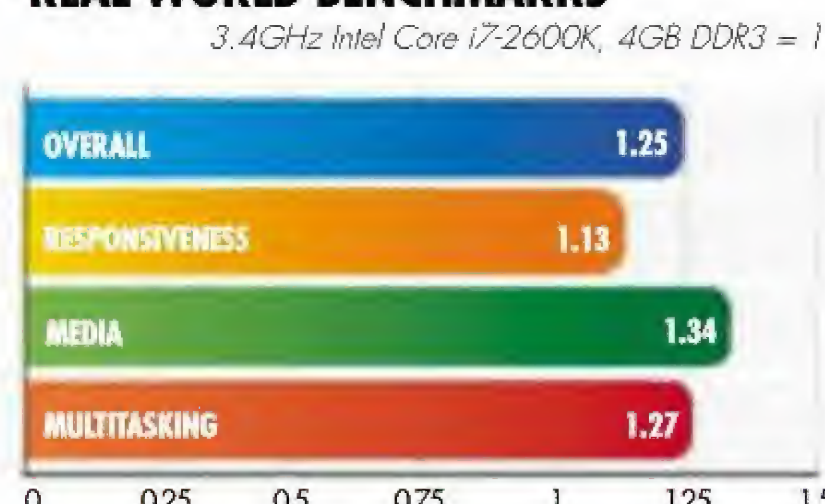
In fact, the Titan is so expensive that it alone costs more than most PCs, and shunts the price of this system up above £2,000. You can't help but be impressed by its specifications, though: it sports 2,688 stream processors, a number that far surpasses the 1,536 of Nvidia's previous flagship card (the GTX 680); it packs in double the number of transistors, at a shade more than seven billion; and its 6GB of GDDR5 memory as the most we've ever seen soldered to a graphics card.

As a result, this Scan PC is a gaming beast, brushing aside our 3D benchmarks with effortless ease. Its score of 93fps in the 1,920 x 1,080 Very High quality Crysis test is a massive 18% faster than the Wired2Fire HAL 4000 (web ID: 380227). It's enough to play any top title on any single monitor at its maximum settings, and there's enough grunt here to handle

## 3D BENCHMARKS



## REAL WORLD BENCHMARKS



demanding games across a trio of monitors too.

An overclocked processor means the Scan doesn't just excel in our games benchmarks. The 3.4GHz Intel Core i7-3770K has been tweaked to run at 4.6GHz, and the 3XS romped through our application tests to a score of 1.25. That's on a par with the record-breaking Wired2Fire, which used an overclocked Core i5 chip.

One area where the Scan's performance can't match its rival is storage, however. The system's single 256GB Samsung 840 SSD can't compete with the Wired2Fire's twin SSDs arranged in RAID0. The Samsung drive returned sequential read and write results of 514MB/sec and 247MB/sec; the Wired2Fire scored 818MB/sec and 183MB/sec respectively.

Still, the Scan is one of the most powerful machines we've ever seen, which is even more impressive given that it's all been squeezed into Fractal Design's tiny Node 304 chassis. It's the same case used by the Wired2Fire, and

it remains one of the most impressive small-form-factor enclosures on the market. The brushed aluminium front looks classy, and the plain-metal side panels – despite showing signs of a little flex – will withstand trips to LAN parties.

Scan has brought its famously fastidious PC building to the pokey Fractal chassis. Cables run in lines along the bottom of the case and others are tied neatly to the Node's metal skeleton (see 1). For all the company's attention to detail, though, the small chassis means the internals are tricky to access, and there isn't much room for upgrades.

We'd advise against further overclocking, too, since the chassis and configuration already struggle to keep the components cool (see 2). At peak load, the overclocked processor hit a toasty

peak temperature of 92°C – only 13°C short of the chip's thermal maximum – and the graphics card's peak of 82°C is high as well. Noise is less of an issue: the Scan is louder during intensive benchmarking than the Wired2Fire, but cranking up the volume on your speakers will quickly mask its rumble.

This Scan is an excellent PC, then, and a Titan in more than just name. It's the fastest gaming PC it's possible to imagine, incredibly quick in other areas, and well put together, too. But the cost of the Nvidia GeForce Titan graphics card alone pushes the price up far too high, and with the cheaper Wired2Fire matching its application and storage benchmark results, you'd have to be mad to spend the extra. **MIKE JENNINGS**

## KEY SPECS

3.4GHz Intel Core i7-3770K overclocked to 4.6GHz • 16GB DDR3 RAM • 256GB Samsung 840 SSD • 2TB Seagate Barracuda hard disk • Nvidia GeForce Titan graphics • Asus P8Z77-I Deluxe motherboard • Fractal Design Node 304 case • 6 x USB 3 • 4 x USB 2 • optical S/PDIF • 2 x eSATA • Gigabit Ethernet • dual-band 802.11abgn Wi-Fi • 3yr RTB warranty • Windows 8 64-bit • 250 x 374 x 210mm (WDH)

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★

◉ The Scan's chassis is compact and attractive





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**BEST OFFER**



# Barnes & Noble Nook HD+

Great hardware for the money, but it's hobbled by restrictive video and app stores, plus a sluggish UI

PRICE 16GB, £158 (£190 inc VAT)

SUPPLIER [www.pcworld.co.uk](http://www.pcworld.co.uk)

The first time Barnes & Noble showed off the Nook HD+ was before Christmas last year. It all went quiet for a while, but the eagerly awaited 9in tablet has finally arrived, and it crams in a huge amount for the money.

It's another ebook reader/tablet hybrid, and it runs a heavily customised version of Android, locked into Barnes & Noble's own book, video and app stores. There's barely a hint it's running Ice Cream Sandwich; Google Play is conspicuous by its absence.

This makes the Amazon Kindle Fire HD 8.9in (web ID: 380932), which also employs its own take on Android and a proprietary app store, its closest rival. The Nook HD+, however, lands the first blow by being substantially cheaper – with prices starting at an astonishing £190 for the 16GB version – and, in many respects, just as good in terms of hardware.

It's thicker and more angular than the Amazon device, and we're not sure about the hole set into one of the corners: it looks like it should serve a purpose, but, short of hanging it on a giant key ring, we can't think what. Build quality is flawless, however: the rear panel is made from solid, grippy, soft-touch black plastic, and the edges and screen surround are hewn from a harder, smoother plastic that's slightly darker in colour.

It's comfortable to hold, even one-handed, and features a microSD slot, allowing you to add up to 32GB to the tablet's 16GB or 32GB of internal storage.

Oddly, for a tablet designed for watching video as much as reading books, there's no HDMI

output, but the display more than makes up for this: it's a stunner. The resolution is a better-than-HD 1,920 x 1,280, giving a pixel density of 245ppi, only 20ppi short of the iPad's Retina display. Quality is beyond reproach, too. Text in ebooks and magazines is super-sharp, the display renders subtly textured backgrounds with convincing realism, and Full HD movies burst with detail.

Despite the glossy finish of the screen, reflections aren't overly intrusive, which is partly due to the fact there's no air gap between the glass front and IPS LCD panel beneath. Brightness is top-notch: at 415cd/m<sup>2</sup>, it's only just behind the latest iPad.

Hardware-wise, there's very little to complain about. Even battery life is respectable: it played our low-resolution test video for 9hrs 33mins at half brightness before the battery was exhausted.

As ever, though, the hardware isn't the whole story, and it's here things start to go wrong for the Nook HD+. It isn't that we don't like the UI: its bright graphics and customisable homescreens are much more pleasant than Amazon's stark, black equivalent. The ability to maintain six user accounts is a boon, too, especially since adult accounts can be password-protected. The Article View, which strips out ads and other web page furniture from online articles, works superbly, and reading glossy magazines on the glorious display is an almost physical experience, complete with curling page animations and a collection of excellent browsing and page-clipping tools.

Our biggest bugbear with the Nook HD+ is sluggish performance. Compared to other Android tablets we've used, including the Kindle Fire HD 8.9in, it feels skittish and jumpy. The carousel graphic on the main



The stunning, better-than-HD display means text and video quality is second to none, but the proprietary app stores leave a lot to be desired

homepage stutters, the store loads slowly and feels horribly laboured, and the Nook HD+'s web browser doesn't feel as fluid and responsive as it should.

This is all the more frustrating since the dual-core 1.5GHz TI OMAP 4470 processor is clearly capable. We recorded decent scores of 1,111ms in SunSpider, faster than the Kindle Fire's 1,343ms. There were no issues with dropped frames during Full HD video playback, either.

While the book, newspaper and magazine store is well stocked and full of content, we're not as impressed with the video store. Its database of films and TV shows is limited, and although in theory you can add films bought through Sony Pictures' UltraViolet cloud-based movie collection system, the one movie in our collection – animated title, *The Pirates! Band of Misfits* – refused to play, claiming it was "unsupported".

The Nook app store, meanwhile, remains a strange place, with plenty of useful and entertaining stuff – Spotify, Evernote, Temple Run and Asphalt 7: Heat – set against an avalanche of tosh, exemplified

by the list of titles in the "Must Have Games" category, which includes Bingo and the low-rent Bejeweled clone, GemClix Duet. Even Amazon's app store is better.

All of which leaves the Nook HD+ in an awkward place. On one hand, the hardware is brilliant, the price is amazingly low, the UI is friendly, and the bookstore is well stocked. On the other, it feels sluggish, and the movie and app stores are sparsely populated. There's plenty of potential, but the lack of content rules out a recommendation. Unless you're willing to make do with books and magazines and aren't bothered by the limited choice elsewhere, the Kindle Fire HD 8.9in offers a far more convincing package. **JONATHAN BRAY**

## KEY SPECS

Dual-core 1.5GHz TI OMAP 4470 CPU • 1GB RAM • 16/32GB storage • 9in 1,920 x 1,280 IPS LCD • 802.11bgn Wi-Fi • Bluetooth • 4,000mAh battery • Android 4 (customised) • microSDHC • 1yr RTB warranty • 163 x 114 x 240mm (WDH) • 500g

## OVERALL

### PERFORMANCE

### FEATURES & DESIGN

### VALUE FOR MONEY



We're not sure what the loop is for, but it's certainly unique



# Kobo Aura HD

An excellent ebook reader that deserves to see off the Paperwhite – but the price is too high

» **PRICE** £117 (£140 inc VAT)  
» **SUPPLIER** [www.whsmith.co.uk](http://www.whsmith.co.uk)

**N**o manufacturer of ebook readers has come closer to matching Amazon with the quality of its devices than Kobo, and it aims to snatch the lead with its latest model, the Aura HD. Aimed at “passionate booklovers”, it’s marketed as the Porsche of ebook readers, and at first glance it looks like one of those rare devices that matches the marketing boasts.

Its silky-smooth finish and solid construction impress immediately. The Aura HD’s finely buffed surface feels more like velvety frosted glass than plastic, and build quality is superb; twist the chassis manfully and there’s barely a creak. Even the USB cable is designed to reinforce the overall perception of quality, with a posh braided sheath instead of the usual drab black plastic. It makes the Amazon Kindle Paperwhite (web ID: 377665) and its siblings feel positively humdrum.

The shape of the Aura HD is unusual. Resembling a folded piece of paper, three subtle creases in the rear panel give you something to grip while reading, your fingers resting securely on the inward crease at the centre and curling around the sides. It works brilliantly, and, with every edge and corner honed to a soft curve, the Aura HD is supremely comfortable to hold.

The use of such quality materials sets the Kobo Aura HD apart from its rivals, but that isn’t the end of its talents. It also sports a 6.8in screen – larger than that of most ebook readers – at a higher resolution of 1,080 x 1,440. This

◉ **Three subtle creases in the rear panel give you something to hold onto while reading**

gives a pixel density of 265ppi – higher than the 212ppi of the Paperwhite, which has a resolution of 758 x 1,024 squeezed into its 6in touchscreen. Remarkably, the Aura HD’s screen is on a par with the Retina display of the iPad 3 and iPad 4.

That extra resolution doesn’t make a huge difference compared to the Paperwhite, but if you hold the two displays around a foot away from your face, you’ll be able to tell them apart; the Aura HD is much crisper than the 600 x 800 Kindle, however.

No flagship ebook reader would be complete without built-in illumination, and the Aura HD obliges with a light that’s at least the match of the Paperwhite. The brightness is adjustable, and only the faintest hint of patchiness is evident along the bottom edge of the screen. Unlike the Paperwhite, which has its light on permanently, the Aura allows you to toggle the light on and off via a button along its top edge.

Perhaps due to the larger screen, the Aura HD is on the chunky side. At 242g, it’s 29g heavier than its rival, and less practical as a result. However, it makes up for the extra heft with the inclusion of a microSD slot for expanding the 4GB of internal memory by 32GB.

We’re also fans of Kobo’s revamped UI. Divided into tiles of various sizes and proportions, it displays thumbnails of books you’re currently reading, stats, and books you’ve finished recently. Links at the bottom of the page lead to the library, the

store (via single-band 802.11n Wi-Fi), and the device’s Reading Life section, which displays detailed reading stats.

It’s all very quick and simple to use. The Aura HD takes as little as 0.6 seconds to refresh the screen, and we found the store both streamlined and responsive. Prices in the Kobo bookstore tend to be a little higher than in the Kindle store, but not prohibitively so, and there’s plenty of content to choose from.

If you don’t find what you’re looking for in the Kobo store, the Aura HD supports Adobe Digital Editions, so you can add books from other stores and digital libraries. It handles other file types with aplomb, too. We loaded our usual selection of ebook reader test files onto it, including graphics-heavy PDFs, and we were able to zoom and pan around pages with a freedom that simply isn’t available to Kindle users.

Kobo’s iOS, Android and desktop apps, meanwhile, offer a similar experience to Amazon’s Whispersync. As long as you’re

connected to Wi-Fi when you finish reading, it’s possible to switch from the Aura HD to tablet or phone and have the book open at the page you last read. There’s even a selection of apps and games, including a sketchpad, a chess game and a web browser. The latter is good for only casual browsing, though, due to E Ink’s comparatively slow refresh rate.

The Kobo Aura HD is a mighty fine device and is as luxurious as ebook readers come. The large, HD display is a pleasure to read on, and the front light is as bright and even as the Kindle Paperwhite’s. The one fly in the ointment is the price: at £140, it costs more than most ebook readers on the market, and it isn’t much cheaper than a compact tablet. Had it been £20 or £30 cheaper, we’d have recommended it without hesitation. As it is, it falls just short. **JONATHAN BRAY**

## KEY SPECS

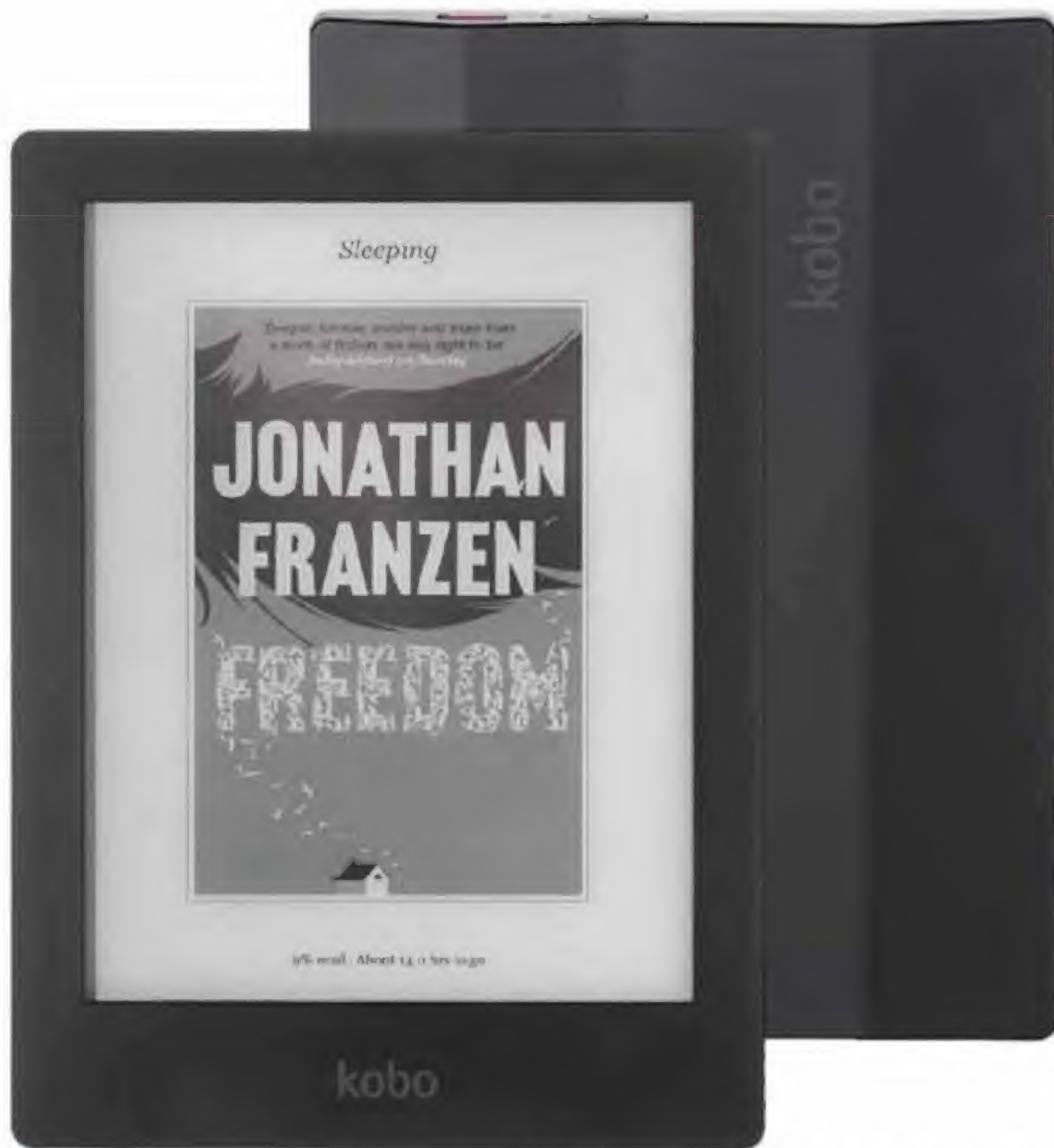
6.8in touchscreen with front light • 1,080 x 1,440 resolution • 4GB memory • 802.11bgn Wi-Fi • 1yr RTB warranty • 128 x 12 x 176mm (WDH) • 242g

## OVERALL

### PERFORMANCE

### FEATURES & DESIGN

### VALUE FOR MONEY



◉ **The build quality of the Aura HD, from the chassis to the USB cable, is top-notch**





See the test shots  
Go to web ID: 381166



# Samsung NX300

Excellent image quality with features that will appeal to amateurs and pros alike

» **PRICE** With 18-55mm kit lens, £500 (£600 inc VAT)  
» **SUPPLIER** [www.currys.co.uk](http://www.currys.co.uk)

**T**he NX300 debuted at CES at the start of the year, but it's only now that the finished product is ready to ship. It sits at the very top of Samsung's compact system camera (CSC) line-up, with a new 20.3-megapixel APS-C sensor, and marks the first time Samsung has used a fold-out screen on a CSC.

Bright and easy to use in direct sunlight, this 3.3in AMOLED display is a real winner. As well as being articulated – allowing you to tilt it up by 90 degrees and down by 45 degrees for hip-held or overhead shots – it's also touch-sensitive. The menus are elegant and easily prodded, but, if you prefer hardware controls, the most important features are accessible via the buttons.

Physically, the NX300 sits at the chunkier end of the scale, despite lacking an integrated EVF. You can downsize the 18-55mm kit lens for a shorter 20-50mm version (30.8-77mm equivalent) and save around £30 in the process, but you'll still have to

accommodate a body that's almost as wide as an entry-level DSLR. It's easy to forgive this, though, since the space is well used with that large screen around the back.

We performed our tests using the 18-55mm lens. This demonstrated slight focal fall-off towards the corners, and obvious barrel distortion on the raw files, which was corrected for in JPEGs. There was slight evidence of chromatic aberration along contrasting edges and fine lines, but had no trouble with complex detail, keeping areas of dense texture – such as receding marsh grass and lichen-encrusted wood – sharp across the frame.

Maximum aperture runs to f/3.5 and f/5.6 at wide-angle and telephoto respectively, and while experienced photographers are likely to stick with aperture priority mode to alter depth of field, Samsung provides another option. The NX300's fantastically intuitive Lens Priority option lets novice users achieve the same effect with a quick twist of the lens ring or swipe of the screen,

without having to learn that wider apertures are used to throw backgrounds out of focus, for example.

In addition, the NX300 offers a few unusual scene modes, for cityscapes, streaking headlights and blurred water. Like Lens Priority, these put amateurs and pros on an equal footing when it comes to shooting



For a compact system camera, the NX300 is a little on the bulky side

tricky subjects: the pros are more likely to dial in the settings; less-experienced users can use the shortcuts.

The NX300 is a much faster camera than its predecessors, with combined phase detection and contrast autofocus locking onto a subject in 0.08 seconds, with no discernible hunting in good light. It's far faster than the Canon EOS M (web ID: 380002), which felt ponderous in comparison. Burst mode delivers 8.6fps in JPEG mode, and the maximum shutter speed is 1/6,000 second.

For handheld shots, sensitivity stretches to ISO 25600, with compensation of three stops in either direction in 1/3EV increments. Low-light performance is good, with grain holding off as far as ISO 800, and remaining light even up to ISO 3200. We'd have no hesitation pushing it towards the upper end of the scale to cope with low-light conditions, rather than slowing the shutter or attaching the bundled external flash. Image quality is second to none, with accurate colours, superb detail and an almost complete absence of compression artefacts on JPEGs.

The NX300 shoots 1080p video footage at up to 60fps. You can set the footage to fade in and out at the start and end of every shot, mute the mic, and switch on the wind-cut feature, which should help dampen the sound of a breeze on your soundtrack. In our tests, however, wind was still audible

when shooting both at the coast and on an open racetrack.

The captured footage is on a par with the stills. It's clean and accurate as far as colours and illumination are concerned, and – when out of the wind – the soundtrack was full of detail. You can edit the result in-camera, too, by setting in and out points during playback.

Finally, the NX300 offers support for NFC, for image sharing with Android devices (although not iOS, sadly), and built-in Wi-Fi. The latter accommodates both 2.4GHz and 5GHz networks, and allows you to share images directly with your tablet, PC or compatible TV, and back up to PCs, Macs and SkyDrive. Sadly, however, there's no support for Dropbox.

All in all, it's an impressive package, and one of the best CSCs available, pairing excellent image quality with well-laid-out controls and a great set of idiot-proof presets. It's keenly priced, particularly since it includes a copy of Adobe Photoshop Lightroom 4 (web ID: 372220), and it's a serious rival to the Sony Alpha NEX-6 (web ID: 378553); it's only the Sony's EVF that keeps it out in front. **NIK RAWLINSON**

## KEY SPECS

20.3-megapixel CMOS sensor • 18-55mm f/3.5-5.6 kit lens • Wi-Fi and NFC • 3.3in 768k touchscreen • SDXC slot • 1,130mAh battery • Adobe Photoshop Lightroom 4 • 1yr RTB warranty • 122 x 64 x 41mm (WDH) • 280g

## OVERALL

IMAGE QUALITY

FEATURES & DESIGN

VALUE FOR MONEY



The NX300 is Samsung's first CSC with a fold-out screen





# Qooq tablet

A tablet that's right at home in the kitchen, but it's far too expensive for such a limited device

» **PRICE** £241 (£289 inc VAT)  
» **SUPPLIER** [www.qooq.com](http://www.qooq.com)

**I**t's always nice to see a product step out of the mainstream and do something different, and that's something the Qooq does from the word go. This is a tablet designed solely for one task – to provide a kitchen-proof, digital recipe book for budding *Masterchef* contestants.

At first blush, you might think that's daft, but actually it isn't such a silly premise. Whenever we want to cook something special at home these days, rather than trawl through a book, our first instinct is to pick up a tablet and hit the internet for recipes and expert advice. Admittedly, this isn't always a brilliant idea: the kitchen is a messy and hazardous place for the average tablet – but the Qooq is designed to take such dangers in its stride.

For starters, it's both splash-proof and heat-resistant. At each corner, there are curved metal feet tipped with rubber, so the Qooq can be laid flat on a smooth surface and stay put, keeping the body of the tablet raised above the surface, so you don't have to worry about spills seeping into open ports.

There's also a handy kickstand, and, rather than having to hunt around for recipes on the internet, the Qooq comes preloaded with 1,000 from more than 100 "top French chefs" (none of these are

household names, however). Recipes can be filtered by a number of parameters: ingredient, dish type, seasonality, difficulty and preparation time. Accompanying each recipe is a list of the equipment you'll need, and by increasing the number of servings required, the ingredient quantities are adjusted automatically.

More importantly, many of the recipes are accompanied by video instructions on how to carry out tricky techniques. It's like having a recipe book and TV cooking show combined in one. For keen amateurs, this is a boon and can save guesswork and research. The first recipe we tried it out on was a Thai prawn curry, which calls for the preparation of raw tiger prawns: a quick trip to the techniques section found a video demonstrating the correct method for removing the head and shell, and de-veining the crustacean ready for cooking. It's crammed with similar tutorials, from de-boning a chicken thigh to preparing a Béchamel sauce.

As a kitchen aid, the Qooq is a well-thought-out piece of kit, then. Even its rather clunky-looking Linux-based interface is well-tuned and reasonably light on its feet, and offers useful additional tools such as a kitchen timer that sits in a pull-out side bar, a meal planner and a shopping-list builder.

However, cooking is the limit of the Qooq's usefulness. It has an



• The Qooq's rubber-tipped feet keep the body of the tablet above a surface when laid flat, so you don't need to worry about spillages

email app, internet radio and video and MP3 players, but these are all basic and there's no way of adding more apps. There's a web browser as well, which supports Flash, but it scores a mediocre 1,958ms in the SunSpider JavaScript benchmark (most modern tablets score 1,500ms or faster), and you'll soon tire of its slow-motion scrolling and lack of multitouch zoom support.

Even if you could load games and other apps on this tablet, the chunky, flexible plastic chassis will put you off whipping it out in public. No matter how rugged Qooq insists it is, the shiny red plastic feels cheap, and the poor quality of the 10.1in, 1,024 x 600 resolution TN screen compounds this impression.

Viewing angles are such that the colours shift significantly when you move away from straight on, and the maximum brightness is only 169cd/m<sup>2</sup> with a woeful 245:1 contrast ratio. Battery life is appalling as well: in our looping video test, it lasted a mere 3hrs 13mins with Wi-Fi off and the screen set to half brightness; in the kitchen, we had to leave it plugged in.

The biggest issue with the Qooq, however, is the price. At £289 inc VAT, it's almost as expensive as a proper 10in

Android tablet such as the Nexus 10 (web ID: 378280), and pricier than compact tablets, too. This might be explained had it included an ongoing subscription to new recipes via the internet, for example. However, Qooq expects its customers to pay for that privilege via a £9.90-per-month, Spotify-style subscription. It's possible to save money by paying for a year upfront, but that only serves to highlight what poor value the whole package is: paying £99 for extra recipes seems like throwing good money after bad.

That, in combination with the rest of its shortcomings – the cheap build quality, the terrible display, the awful battery life and the high purchase price – means the Qooq tablet isn't something we can recommend to anyone other than the most gadget-obsessed cooking fanatic. It's a shame, since we very much like the idea of a sensibly designed, robust kitchen tablet. **JONATHAN BRAY**

## KEY SPECS

1GHz ARM Cortex A9 dual-core CPU • 1.5GB storage  
• 10.1in 1,024 x 600 TFT • SD card slot • USB •  
10/100 Ethernet • Linux-based OS • 1yr RTB  
warranty • 280 x 29 x 183mm (WDH) • 856g

<b>OVERALL</b>	★ ★ ★ ★ ★
<b>PERFORMANCE</b>	★ ★ ★ ★ ★
<b>FEATURES &amp; DESIGN</b>	★ ★ ★ ★ ★
<b>VALUE FOR MONEY</b>	★ ★ ★ ★ ★



• A kickstand props up the Qooq tablet at an ideal angle





# Fuze Powered by Raspberry Pi

A robust case that turns the Raspberry Pi into a comprehensive educational workstation; the keyboard is poor and the price high, but you do get a lot for your money

**PRICE** £150 (£180 inc VAT)

**SUPPLIER** [www.fuze.co.uk](http://www.fuze.co.uk)

**D**on't adjust your set: although it may look like a 1980s throwback, the Fuze is a new initiative from Aylesbury-based Binary Distribution. Simply put, it's a sturdy metal keyboard enclosure for the Raspberry Pi.

Aesthetically, the Fuze won't be to everyone's taste: in this age of Ultrabooks and sleek tablets, the clunky design, with its integrated keyboard, looks decidedly archaic. While some will

consider that in keeping with the retro charm of the Raspberry Pi, it may not strike such a chord with those too young to remember the classic home micros from which the Fuze takes its design cues.

That's a shame, since kids are the Fuze's target audience. Following consciously in the footsteps of the fondly

remembered BBC Micro series, Binary Distribution has targeted the Fuze at schools – a fact that perhaps explains the tough aluminium casing.

Each unit also comes with a deck of 16 colourful and jovially written project cards aimed at key stages 1 to 4 (ages five to 16) that guide students through the fundamentals of BASIC programming, starting with a classic "Hello World" program

before moving on to more advanced concepts such as variables and loops.

## Hard-wired

The Fuze also encourages kids to get hands-on with the electronic engineering side of things. A cavity at the top of the casing holds an extension board that exposes the Raspberry Pi's 26 general-purpose I/O pins, alongside a 640-pin connector



## KEY SPECS

Raspberry Pi with 700MHz Broadcom BCM2835 SoC and 512MB RAM • 8GB SD card with Raspbian Wheezy and Fuze Basic preinstalled • 1 x USB 2 • 10/100 Ethernet • HDMI • 3.5mm audio • 640-pin connector solderless breadboard • electronic component kit • Fuze case: 331 x 234 x 73mm (WDH)

**The Fuze combines a Raspberry Pi and a keyboard**



❖ **The sturdy case keeps cables tidy and protects the Raspberry Pi's ports**

solderless breadboard into which components and wires can be plugged and replugged.

With the aid of the appropriate lesson cards, and the included box of electronic components (which includes LEDs, switches, buttons, numeric displays and a two-axis joystick), students can build complex working circuits while simultaneously developing the back-end code to drive them. It's an admirably practical and holistic approach.

A welcome side effect of the all-in-one design is the convenient arrangement of the Raspberry Pi's ports along the backplate; an improvement on the bare board that has connectors budding off on every side. Not only does this make cable management neater, it also makes it more difficult to damage the Pi, or send it flying across the room, by accidentally yanking or twisting a cable.

### Design flaws

We're disappointed Binary Distribution hasn't taken the opportunity to build a USB hub into the design, however.

Since the keyboard takes up one USB connector internally, you're left with a single port for the mouse and no convenient scope for further expansion. Considering the Fuze is almost entirely hollow, it shouldn't have been difficult to accommodate a few extra ports, which would have made it easier to move project files back and forth via a USB flash drive.



The biggest letdown, however, is the keyboard. While some of us may harbour fond memories of late nights spent tapping away on our old microcomputers, the truth is, the 1980s were a dark time for keyboard ergonomics; sadly, the Fuze follows in that tradition.

The keys are plasticky and insubstantial, their perfect flatness and proximity to one another does nothing for typing accuracy, and – since they're elevated – you can forget about any sort of wrist support. The Return key and spacebar are annoyingly small, too, and the incongruous presence of two Windows keys serves only to erode the Fuze's identity.

### Pricing

Before long, we quickly found ourselves clamouring for a regular PC keyboard. In fairness, there's nothing stopping you opening up the Fuze's case, disconnecting the built-in keyboard and plugging in something nicer.

This would rather undermine the point of the all-in-one design, however, and it rankles when you consider the price: the Fuze package, including a Raspberry Pi

Model B and the aforementioned box of components, goes on sale in late May for £180 inc VAT – five times the price of the Pi on its own. For that sort of money, a decent keyboard ought to be a given.

If you already own a Raspberry Pi, it's possible to buy the Fuze case alone (minus the breadboard, components box and lesson cards) for £90 inc VAT. Interestingly, Binary Distribution plans to offer a model that comes with a Maximite microcontroller-based system instead of a Raspberry Pi. Similar to the Raspberry Pi, the Maximite offers 40 I/O lines that can be used for electronics projects, and might make a more accessible platform for beginners than the Raspberry Pi, since it boots directly into a BASIC environment.

For our money, however, the fact the Raspberry Pi allows you

to progress seamlessly from BASIC into Python and other more advanced languages gives it the edge, especially since the two models are to be offered at the same price.

### Verdict

All in all, the Fuze is an appealing concept, but it's let down by the keyboard, and we can't help but suspect the price will discourage budget-conscious schools – a cheap case and a regular keyboard will cost much less.

However, if you can swing the price, it's the most coherent introduction we've seen to computing and electronics, realising the full educational potential of the Raspberry Pi in one neat package.

DARIEN GRAHAM-SMITH

<b>OVERALL</b>	★★★★☆
<b>PERFORMANCE</b>	★★★★☆
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★☆



❖ **The Fuze offers little scope for expansion – only one USB port is available**



# Nokia Lumia 520

A trailblazing handset that cements Nokia's position as king of the entry-level smartphones



**PRICE** SIM-free, £117 (£140 inc VAT); from free on a £15.50/mth, 24mth contract  
**SUPPLIER** [www.lambda-tek.com](http://www.lambda-tek.com)

**N**okia largely failed to stake out the smartphone high ground with the Lumia 920 (web ID: 377911), but it's making a strong charge for the budget end of the market, first with the Lumia 620 (web ID: 380092) and now the Lumia 520, a fully fledged smartphone, for less than £150.

Until now, that sort of money would have landed you a joyless Android handset with a fuzzy screen and the turn of pace of

a three-legged corgi. With the 520, Nokia has delivered a responsive smartphone with more features than you've any right to expect at this price.

Inevitably, a smartphone priced at less than £150 involves compromises, but Nokia has made them in all the right places. The 4in display has a resolution of only 480 x 800, which is less sharp than the latest smartphone kingpins such as the Full HD HTC One (web ID: 380965), but not to the point where pixellation becomes distracting.

The measured brightness of 352cd/m<sup>2</sup> certainly won't have you reaching for the Ray-Bans, and is significantly dimmer than the LCD

punch to the bold colours on the Windows Phone 8 homescreen.

Under that screen lies exactly the same core specification you'll find in the 620: a 1GHz Snapdragon 4 processor, 512MB of RAM and 8GB of internal storage, which can be supplemented by up to 64GB via the phone's microSD card slot.

You'll find that slot by prising off the 520's interchangeable backplate, where you'll also uncover a replaceable, old-school BL-5J battery. The 520's bodywork is slightly more compact than the 620's, and it's a couple of grams lighter, too. Not surprisingly, the 520 lacks the luxurious finish of the 920, but there's no hint of nastiness about the design.

There's nothing shameful about the 520's performance, either. You can fling cars around the track in Asphalt 7: Heat without any discernible drop

**The 520 has a superb out-of-the-box software bundle**

screen on the slightly pricier 620, but it's sufficient in bright daylight. A contrast ratio of 838:1 adds

# Jabra Revo Wireless

**PRICE** £165 (£199 inc VAT)  
**SUPPLIER** [www.handtec.co.uk](http://www.handtec.co.uk)  
**OVERALL** ★★★★★

via USB, or double as a conventional set of headphones with the supplied 3.5mm audio cable. NFC support allows you to pair a compatible handset by pressing it against the left earcup: tapping or swiping a finger around the earpieces skips tracks and adjusts the volume, and a button on each earpiece accepts, rejects or ends calls. The all-grey design is enlivened with flashes of orange, and the headband folds down to allow the headphones

to slip into the supplied travel bag. They're sturdy enough to survive life on the move, and although the memory-foam-filled earpads tend to become a little sweaty, they're comfortable. Sound quality is average, however.

Regardless of the connection type, music emerged thick, muddy and smothered with bass. The matching Jabra Sound mobile app did little to rectify matters, with the Dolby Digital Plus processing acting as little more than a graphic equaliser. The

Revos can be used numerous ways, but, at this price, we'd expect far better audio. **SASHA MULLER**

Jabra's Revo Wireless aren't your usual pair of Bluetooth headphones. They can act as a Bluetooth headset, connect directly to a laptop or PC

# Arcam rBlink

**PRICE** £133 (£160 inc VAT)  
**SUPPLIER** [www.petertyson.co.uk](http://www.petertyson.co.uk)  
**OVERALL** ★★★★★

Physically, it mimics Arcam's excellent USB audio device, the rPAC – it's hewn from the same solid-feeling metal. The only difference is the connectivity on offer. Twin RCA jacks provide a stereo output for connection to a hi-fi; a coaxial digital output hooks up to external DACs or home-cinema amplifiers; and there's a single Bluetooth antenna. Setup is quick and easy: push the button at the rear, select the rBlink from your device's Bluetooth menu, and press play. While Bluetooth audio is often scratchy, the rBlink's aptX support allows it to ferry higher quality audio from compatible devices. Compared to a wired connection from a laptop, we noted barely any perceptible loss of sound quality. It works well, then, but the quality comes at a price. iOS devices will be better served by the cheaper Apple TV or AirPort Express, and for those with basic stereo systems, it won't be worth the outlay. If you're after the ultimate in Bluetooth audio quality, however, it may be worth saving for.

**SASHA MULLER**

Arcam is a familiar name in the world of hi-fi separates, and its rBlink aims to work wonders with Bluetooth music streaming.





in frame rate, and the Windows Phone 8 menus never stutter beneath your fingers (even gloved fingers, thanks to “super-sensitive” touch-display technology). A score of 1,497ms in the SunSpider benchmark confirms the 520 is a capable performer, without troubling the higher echelon of handsets.

Avid photographers may want to look elsewhere, however. The sole rear-facing 5-megapixel camera doesn't come with a flash (unlike the 620), and photo quality is middling, although the assortment of free photo apps that come with the 520 help rescue iffy shots. Indeed, it's the strength of

the software bundle that makes it hard to believe this is such a cheap phone: the tailored playlists of Nokia Music, the downloadable maps and turn-by-turn satnav of Nokia Drive, and the bundled Office apps make for an out-of-the-box package that even the iPhone can't match.

With a battery that will just about get you through the day – it had 60% remaining on the gauge after our 24-hour test – there really is very little here to complain about. The 520's blend of understated design, capable performance and a generous software bundle makes it the best-value smartphone on the market. Welcome back, Nokia – you've been sorely missed. **BARRY COLLINS**

#### KEY SPECS

Dual-core 1GHz Snapdragon 4 CPU • 512MB RAM • 8GB storage • 4in 480 x 800 IPS LCD display • quad-band GSM • GPRS/EDGE/3G/HSDPA • Bluetooth 3 • 802.11bgn Wi-Fi • 5MP stills • 720p video • 1,430mAh Li-ion battery • Windows Phone 8 • 1yr RTB warranty • 64 x 11.7 x 120mm (WDH) • 122g

<b>OVERALL</b>	★★★★★
<b>PERFORMANCE</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★

## Blue Microphones Spark Digital

» **PRICE** £126 (£151 inc VAT)  
 » **SUPPLIER** [www.amazon.co.uk](http://www.amazon.co.uk)  
 » **OVERALL** ★★★★★

and iOS-compatible mic. The Spark Digital retains the retro styling and weighty build of its studio-focused stablemate, but does away with the need for a pre-amp equipped with +48v phantom power. Instead, the Spark Digital has a mini-USB connection and a pair of cables for connecting to a standard USB socket or the 30-pin connector of an iOS device (you'll need a 30-pin-to-Lightning adapter for newer models). A dial adjusts the input volume, or clicks inwards to mute the audio, and a rocker switch toggles the Focus mode on and off, which tweaks the frequency response to give more presence and high end. In our tests, the Spark Digital recorded rich, crystal-clear 44.1kHz audio at 16 bits. The heavy, adjustable stand makes it easy to secure the mic in the perfect position, and, since the mic is isolated from the stand by bungee cords, recordings pick up little in the way of extraneous thumps or vibrations. At £151, it's overkill for podcasting, but, for musicians, the ability to record superb-quality audio on the move is immensely attractive. **SASHA MULLER**



[www.pcpro.co.uk](http://www.pcpro.co.uk)



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**PC Pro Digital Edition available on iPad, iPhone and Kindle Fire**



# Eizo ColorEdge CG276

Superb image quality delivered by the best professional monitor on the market

**PRICE** £1,332 (£1,598 inc VAT)  
**SUPPLIER** [www.nativedigital.com](http://www.nativedigital.com)

**T**he ColorEdge CG275W (web ID: 368146) has spent almost two years on PC Pro's A-List, and for good reason. Eizo's flagship 27in monitor delivers stunning image quality – and maintains it, thanks to its built-in colorimeter. Now, Eizo seeks to improve upon near-perfection with an updated model – the ColorEdge CG276.

Initially, it's tough to tell the two monitors apart. Both use the same chunky matte-black chassis, but that isn't a bad thing: build quality still feels bomb-proof, and the sturdy stand provides 152mm of height adjustment, as well as tilting back and forth and spinning smoothly left and right.

At the rear, however, Eizo has made a couple of changes that will

be of interest to video-production buffs. While mini-DisplayPort has fallen by the wayside, the DVI and full-sized DisplayPort connections are now supplemented by an HDCP-enabled HDMI input, supporting resolutions up to Full HD, and accepting both *interlaced* and 24fps video inputs. The DisplayPort still supports 10-bit colour input, and also 2K and 4K signals, which are scaled automatically to fit the Eizo's native 2,560 x 1,440 resolution.

The Eizo's 27in IPS panel has been upgraded, too, with the quoted contrast ratio rising from 850:1 to 1,000:1, and maximum brightness increasing from 270cd/m<sup>2</sup> to 350cd/m<sup>2</sup>.

In practice, however, with the CG275W and CG276 side by side, both calibrated to a usable everyday brightness of 120cd/m<sup>2</sup>, we found it near impossible to detect any difference.

Image quality remains staggeringly good. The CG276's anti-glare coating still suffers the same graininess as the CG275W – we hoped Eizo might have managed to bring the CG276 in line with the grain-free coating of the ColorEdge CX240 (web ID: 377272) – but colour accuracy remains high. Testing the Eizo's pre-calibrated sRGB mode, our X-Rite i1Display 2 reported an average

**The CG276 can be used in portrait and landscape**

**PC PRO A-LIST**



**The ColorEdge CG276 delivers superlative, colour-critical performance**

Delta E of 1.3 and a maximum of 3.9. With the Adobe RGB mode activated, the Eizo provided a Delta E of 1 and a maximum of 3.6.

Eizo's ColorNavigator software also allowed us to compare calibration results between the CG276's internal colorimeter, X-Rite's i1Display 2 and the newer X-Rite i1Display Pro. Our reference X-Rite i1Display 2 is known to struggle with wide-gamut displays, and produced an overly warm tone, with whites looking slightly rosy. The CG276's internal sensor produced excellent results, however, appearing to our eyes to be on a par with the X-Rite i1Display Pro. In fact, ColorNavigator indicated that the CG276's internal colorimeter did a better job, providing an average Delta E of 0.5 and a maximum of 1.7, a contrast ratio of 827:1 and a colour temperature of 6,496K.

Brightness uniformity remains excellent. The Digital Uniformity Equalizer does a tremendous job, and having measured the CG276's brightness across 44 points on the panel, we found no more than a 5.8% deviation in brightness. That's better than any other high-end monitor we've seen.

ColorNavigator remains as flexible as ever: calibration targets can be selected from a wide range of colour spaces, brightness levels,

gamma curves and white points. The CG276's built-in sensor can be set up to use a third-party calibration device as a reference point – handy for ensuring accurate colour matching across multiple monitors. It's also possible to emulate the colour response of tablets and smartphones for soft-proofing purposes, although a third-party spectrophotometer is required.

The ColorEdge CG276 is expensive, but for colour-critical professional use it's unbeatable. The addition of HDMI and a proper 1080/24p display mode give the CG276 the edge over its predecessor for video-production duties, and the subtle panel improvements are welcome, too. If you can find the old model for a bargain price and don't need the new features, we suggest you snap it up while you can; if you're looking for the finest, most flexible 27in monitor money can buy, the ColorEdge CG276 is most definitely it. **SASHA MULLER**

## KEY SPECS

27in 2,560 x 1,440 IPS TFT • DVI • DisplayPort • HDMI • 2 x USB 2 • internal power supply • 646 x 282 x 577mm (WDH), fully extended • 5yr RTB warranty (1yr zero-pixel-defect warranty)

## OVERALL

IMAGE QUALITY

FEATURES & DESIGN

VALUE FOR MONEY







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- Zardou, KitGuru.net

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- 3 Year Silver Warranty

**from £879 inc VAT**



"PC Specialist has gone to great pains to make the Vanquish 300R an outstanding gaming system..."  
- Kat Orphanides, Expert Reviews

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# Synology DS213air

Flexible, powerful and remarkably easy to use – the best consumer NAS drive around

» **PRICE** Diskless, £190 (£228 inc VAT)  
» **SUPPLIER** [www.ballicom.co.uk](http://www.ballicom.co.uk)

Centralising storage is becoming increasingly important as consumers move from PCs and laptops to storage-poor tablets for their home-computing needs, but there can be practical difficulties. NAS drives can be noisy and intrusive, and most require a wired network connection, making it tricky to hide them away in a quiet corner.

That's precisely the dilemma Synology's latest box, the two-bay DS213air, is designed to solve. As well as a Gigabit Ethernet

connection, it boasts 2.4GHz 802.11n wireless, which gives it far more flexibility than the average Ethernet-only NAS drive.

It also makes it incredible easy to set up. Once you've secured one or two hard disks under the thin, plastic case, and switched it on for the first time, it's possible to connect directly to the DS213air's wireless network, and set up the disk array, without having to worry about running a setup utility on a PC or laptop first.

Once done, you can choose to deploy the wireless in a number of ways. First, it can be used to connect the DS213air directly to



» A Windows-like web UI makes the DS213air simple to use

network allows – but it keeps cable clutter to a minimum, and you can place the drive wherever you like.

In the second wireless mode, the DS213air operates as a wireless access point, allowing laptops, tablets and phones to connect to the NAS directly over its own, private wireless network. In this mode, it needs a wired connection to the network for updates and access to the internet.

Finally, cable users can connect the DS213air directly to their cable modem and use the DS213air as a wireless router. However, the basic, single-band 2.4GHz wireless capability and lack of extra Ethernet ports at the

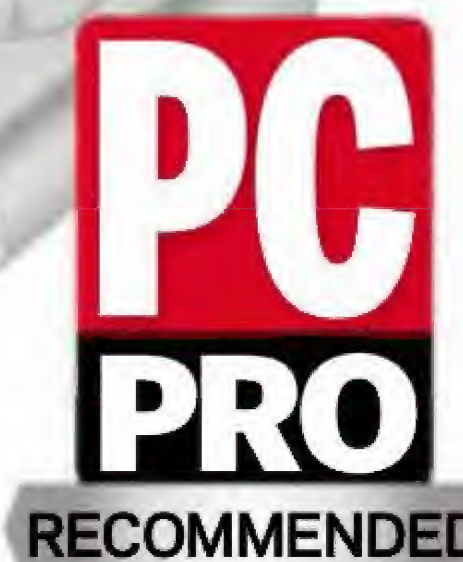
your home wireless network, as with any other client device. Performance won't be particularly fast in this mode – file transfers will be as quick as your wireless

# Freedom i-Connex

» **PRICE** £28 (£33 inc VAT)  
» **SUPPLIER** [www.amazon.co.uk](http://www.amazon.co.uk)  
» **OVERALL** ★★★★★

Freedom was producing mobile Bluetooth keyboards long before smartphones and tablets became a worldwide obsession, and its folding

keyboard design is a classic. The main attraction is that you still get large, near-desktop-sized keys, despite its small size. This makes long typing sessions very comfortable; we found it easy to get close to our full typing speed. The key action itself is positive, although a little on the shallow side, which is surprising, given the thickness of the keyboard (around 12.7mm unfolded). There are a number of thoughtful touches. Embedded in one half of the keyboard is a pull-out, folding smartphone stand; there are separate media playback and volume buttons running down the left edge; and four rubber feet prevent the i-Connex from sliding on smooth surfaces. It also remembers four pairings, so you can switch from device to device without having to re-pair. It isn't perfect: there's no rechargeable battery (it runs on a pair of AAAs); it doesn't power down automatically when folded away; the integral stand doesn't work with tablets, so you have to use the separate bundled stand; and it refused to work with some Android devices. However, the good points outweigh the bad, and the low price makes it very tempting. **JONATHAN BRAY**



# iTwin Connect

» **PRICE** \$129 (around £83)  
» **SUPPLIER** [www.itwin.com](http://www.itwin.com)  
» **OVERALL** ★★★★★

The idea behind iTwin's ingenious USB device is simple: to make remote connection between two computers as easy and secure as possible.

To set up your connection, simply split the double-ended USB stick in half, plug one into the computer you need to access and the other into the PC or laptop you're accessing it from; once you've installed the client software on each and set up an account, you're connected. At its most basic level, the iTwin connection gives you remote desktop control over the remote PC, and VPN access to shared files. Nothing unusual, you might think, but the difference with this handy USB device is that the connection is hardware-encrypted, and, since the key is embedded in each half of the stick, the connection is completely private. This isn't the end of the iTwin's talents, however. The ingenious Teleport Me function uses the firm's servers in the US, Europe and Singapore to effectively browse from those locations, thus sidestepping geographic restrictions. You can also use the feature to browse your home PC's internet connection, enabling you to watch BBC iPlayer from abroad, for example. Considering you'd normally pay a subscription for such a service and it's available for no extra charge here, it makes the iTwin Connect a bit of a bargain, even without the encrypted VPN and remote desktop features. **JONATHAN BRAY**



rear means this method doesn't hold much appeal.

However you choose to deploy the DS213air, though, it retains all the features that have made its predecessors favourites at *PC Pro*. Its Windows-like DSM 4.2 web UI makes every aspect of it incredibly easy to use, from file browsing to setting up more advanced features, such as the bundled web server. It's extendable via a range of downloadable software packages, and a selection of free Android and iOS apps makes browsing files and streaming media child's play.

Performance is similar to that of its predecessor, the DS212j (web ID: 374536). Over a wired Gigabit Ethernet connection,

top speeds hit 68MB/sec and 71MB/sec for large-file reads and writes, and 512KB files copied across at 33MB/sec and 71MB/sec respectively. Direct file transfers over 802.11n Wi-Fi came in at 13.2MB/sec at close range, dropping to 3.5MB/sec from 40m – on a par with a decent, single-band wireless router.

With a quiet cooling fan, and both USB ports now upgraded to USB 3, our only gripe is the DS213air's lack of advanced 5GHz connectivity. It's also a little pricey for a dual-bay enclosure. However, these minor drawbacks detract little from what is, in all other respects, a fantastically easy-to-use and powerful NAS drive. **JONATHAN BRAY**

#### KEY SPECS

1.6GHz Marvell CPU • 256MB RAM • 2 x 3.5in/2.5in SATA II drive bays • Synology Hybrid RAID • JBOD • RAID0, 1 • Gigabit Ethernet • 2 x USB 3 • 2yr RTB warranty • 100 x 225 x 164mm (WDH)

<b>OVERALL</b>	★★★★★
<b>PERFORMANCE</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★

## Logitech Ultrathin Keyboard mini

» **PRICE** £50 (£60 inc VAT)  
 » **SUPPLIER** [www.amazon.co.uk](http://www.amazon.co.uk)  
 » **OVERALL** ★★★★★

One of our favourite Bluetooth keyboards for the iPad is Logitech's Ultrathin Keyboard Cover, so we expected great things from its iPad mini sibling. We weren't disappointed. Like the full-sized version, it doubles as a cover, clipping magnetically onto the left edge of Apple's smaller tablet. While in use, the iPad docks into a magnetised slot above the keyboard, and although we'd prefer the angle to be a little slacker, the iPad mini's wide viewing angles mean this isn't a problem. The key to the Logitech's success, however, is the quality of the keyboard. Despite measuring only 6.6mm thick, every key has a surprising amount of travel and positive feedback. Inevitably, some compromises have been made. The backspace, colon and apostrophe keys are tiny, and the price is a little high. However, this mini keyboard is the business, and given the quality on offer, we suspect it will remain best in class for some time. **JONATHAN BRAY**



» The Hero3 offers stunningly detailed video footage



## GoPro Hero3: Black Edition

Capable of shooting HD footage where most video cameras fear to tread, the GoPro Hero3 is simply superb

If strapping a video camera to your head and jumping off things is your idea of fun, chances are you've already heard of GoPro. Its wearable action camera, the Hero, has reached its third generation, and it's been souped up with new features.

The Hero3: Black Edition is GoPro's top-of-the-range model. While the White and Silver Editions make do with 1080p recordings at 30fps, this shoots 4K video at up to 15fps, alongside a dizzying array of other formats.

The Hero3 is smaller than the Hero2, and its rubberised casing feels less plasticky. As before, a rechargeable battery clips into the rear, and it's rated to last for 1hr 30mins of 30fps 1080p video recording. A microSD slot on the side is accompanied by mini-USB and micro-HDMI connections.

Three buttons and a tiny mono LCD make it easy to flick through the vast array of video, photo, time-lapse and burst options, while 802.11n wireless connectivity allows you to do the same via the bundled Wi-Fi remote, or free iOS and Android apps (which allow for monitoring of live footage, too).

» **PRICE** £299 (£359 inc VAT)  
 » **SUPPLIER** [www.parkcameras.com](http://www.parkcameras.com)

The Hero3 is incredibly flexible. The bundled transparent housing is waterproof to 60m, and a pair of flat and curved sticky pads makes it easy to mount it to almost anything. Aftermarket mounts are available for attaching the camera to chest straps, helmets, handlebars and more, and there's a huge range of accessories available, too.

Video quality is better than ever. The 4K footage is little more than a novelty due to the low frame rate, but the Hero3 produces stunning results at 2.7K and below. There's very little noise, even in low light, and the amount of detail is staggering.

GoPro has outdone itself with the Hero3: Black Edition. It packs huge potential into a tiny package that will survive the kind of rough and tumble that would spell doom for traditional camcorders or DSLRs. Casual users will be better off with the cheaper White or Silver Editions, but if you want the best-quality action camera around, save your pennies and plump for this one. **SASHA MULLER**

#### KEY SPECS

4K@15fps • 2.7K@30fps • 1080p@60fps • 12MP stills • f/2.8 glass lens • mini-USB • micro-HDMI • microSD • 802.11bgn Wi-Fi • Wi-Fi remote • waterproof housing • 1yr warranty • 79 x 40 x 75mm (WDH) • 180g (in waterproof case)

<b>OVERALL</b>	★★★★★
<b>IMAGE QUALITY</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★



# Nvidia GeForce GTX 650 Ti Boost

Powerful and efficient: hands down the best mainstream card on the market

» **PRICE** £125 (£150 inc VAT)  
» **SUPPLIER** [www.scan.co.uk](http://www.scan.co.uk)

**D**eveloping new GPUs is expensive, so it's no surprise to see firms making the most of what they've got. Nvidia's GeForce GTX 650 Ti Boost does just that, building on last year's non-"Boost" Ti card and improving it across the board.

The older card's 928MHz core clock has been raised to 980MHz, and the Ti Boost also benefits from Nvidia's GPU Boost technology, which dynamically overclocks the core to 1,032MHz if it hasn't hit its 134W power ceiling.

## KEY SPECS

28nm die • 768 stream processors • 980MHz core clock • 1,032MHz boost clock • 2.5 billion transistors • 2GB GDDR5 RAM • 192-bit memory bus • 243 x 111 x 38mm (WDH)

The Ti Boost has 2GB of GDDR5 memory clocked at 1,502MHz, which trumps the 1,350MHz speed of the 650 Ti, and the 192-bit memory bus is wider than the 128-bit hardware on the older card. The underlying architecture is the same, however, with 2.5 billion transistors and 768 stream processors divided into three GPU clusters.

The Ti Boost competes with the £110 AMD Radeon HD 6850 (web ID: 362152), and there was only one winner in our benchmarks. The Ti Boost's result of 47fps in the 1,920 x 1,080 Very High quality Crysis benchmark trounced the 33fps score of the Radeon, and it still scored 40fps when we added 4x anti-aliasing – 11 frames faster than its rival.

The card continued its good form in Battlefield 3. With the game running at 1,920 x 1,080

» **The Ti Boost's 243mm length will fit most cases**

and Ultra settings, the Ti Boost scored 66fps, falling to 48fps when we activated 4x anti-aliasing. That's a fair drop, but there's still enough power to play top-end games without compromising on quality.

It isn't too long for most cases, at 243mm, nor too power-hungry: it requires only a single, six-pin connector to run. It's quiet, even in the most demanding tests, and runs cooler than its rival: the Ti Boost peaked at 74°C, while the Radeon HD 6850 hit a maximum of 83°C. Our test rig's peak power draw was 178W with the Nvidia card installed, far lower than the 248W with the AMD card in place.

**PC PRO**  
**A-LIST**



It's a clean sweep for the Ti Boost, then. It's more expensive than its rival, but greater power, better thermal performance and increased energy-efficiency mean it's the card of choice for single-screen gaming. **MIKE JENNINGS**

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★

# AMD Radeon HD 7990

Blazing speed, but this card is too expensive for all but the most extreme gamers

» **PRICE** £754 (£904 inc VAT)  
» **SUPPLIER** [www.scan.co.uk](http://www.scan.co.uk)

**I**t's more than a year since the first HD 7000 Series cards appeared, but AMD has at last launched a flagship model – and what a card it is. The Radeon HD 7990 is a dual-core monster, but it comes in at the highest price we've ever seen for a graphics card.

The price can be explained in part by the card's use of two Radeon HD 7970 cores, clocked at 1,000MHz, rather than the normal 925MHz, and also by the

## KEY SPECS

Dual Radeon HD 7970 cores • 28nm die • 4,096 stream processors • 1,000MHz core clock • 8.6 billion transistors • 6GB GDDR5 RAM • 2 x 384-bit memory bus • 306 x 98 x 39mm (WDH)

6GB of GDDR5 RAM, which is more than we've ever seen on a graphics card. Between them, the twin cores pack in a massive 8.6 billion transistors and 4,096 stream processors.

The HD 7990 blitzed our benchmarks, easily beating the Nvidia GeForce GTX 680 (web ID: 373696). It scored 80fps in our 1,920 x 1,080 Very High quality Crysis benchmark, 10fps ahead of the GTX 680, and 4x anti-aliasing hardly slowed it down – it scored 75fps. In Battlefield 3, it zipped through the Ultra quality 1,920 x 1,080 test at 160fps, returning a score of 116fps when 4x anti-aliasing was activated.

It has enough power to handle gaming across three screens at a resolution of 5,760 x 1,080. At Very High quality, it ran Crysis at 52fps and Battlefield 3 at 88fps.

» **Twin cores pack in 8.6 billion transistors**

AMD has used serious hardware to keep temperatures down. The bulk of the 306mm-long card is occupied by a huge heatsink, and it's topped with three 90mm fans that keep the top temperature of the card down to an impressively low 72°C. Power consumption is another story, however: our test rig drew 418W from the mains when stress-tested, and the card requires two eight-pin power connectors.

The HD 7990 is the quickest card on the planet, but it isn't cheap. For £160 less, you can get two GTX 680s, a configuration



that will also comfortably play games across three screens. It's a remarkable graphics card, but only the wealthiest gamers need apply. **MIKE JENNINGS**

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★



# Ubuntu 13.04

A modest update, bringing no major enhancements but adding polish to the Ubuntu desktop

» **PRICE** Free  
» **SUPPLIER** [www.ubuntu.com](http://www.ubuntu.com)

**U**buntu's tight, six-monthly release schedule tends to bring only small updates between versions – and so it is with Ubuntu 13.04, known familiarly as the Raring Ringtail. Beyond the expected upgrades to the latest versions of bundled apps and resources, there's no really major advance over last October's release (web ID: 377638).

You do, however, get a good set of interface upgrades. Launcher icons have been updated, with the Workspaces icon now giving a helpful, at-a-glance indication of which virtual desktop you're using. Under-the-bonnet upgrades to Unity make searching via the dash more responsive, and a new

degree of "typo-tolerance" means missed or switched letters won't necessarily mess up your search.

Window handling has been spruced up, too. You can now roll the mouse wheel over a Launcher icon to scroll quickly between an application's open windows. Drag a window to the edge of the screen and a translucent animation now shows where it will snap to. Such minor tweaks make the desktop feel slicker and more user-friendly.

At the top of the screen, Ubuntu's menu system hasn't evolved, but a new Ubuntu One dropdown at the right now gives you direct Dropbox-style access to your sync folder and settings. An updated Bluetooth menu lets you make your device discoverable without having to dive into the Settings dialog. And if you select Shut Down from the main system



» **Ubuntu's latest free update makes the desktop more user-friendly**

menu, a graphical overlay prompts you to restart or power off.

If you've standardised on a Long-Term Support (LTS) edition of Ubuntu, Raring Ringtail isn't worth abandoning your stable platform for, especially since Canonical has slashed the support window for non-LTS releases from 18 months to only nine. For everyone else, Ubuntu 13.04 feels slicker and more

mature than its forebear, and as usual it's offered as a free upgrade to existing Ubuntu users via the Software Updater – so we see no reason for users of Ubuntu 12.10 not to upgrade as a matter of course. **DARIEN GRAHAM-SMITH**

<b>OVERALL</b>	★★★★★
<b>EASE OF USE</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★

# gDoc Binder

A strikingly simple means of collating notes into virtual folders, but it's bogged down by performance glitches

» **PRICE** 10 binders, \$10  
» **SUPPLIER** [www.gdoc.com](http://www.gdoc.com)

**F**or all its strengths, many people find Microsoft's OneNote over-complicated: its taxonomy of notebooks, sections and pages can leave newcomers bewildered. There's no danger of that with gDoc Binder, which brings an almost Apple-like level of skeuomorphic design to note-taking applications.

The software is presented as a virtual ring binder, in which it's easy to collate documents from a project, such as a contract pitch or a house move. Word documents, spreadsheets, PowerPoint presentations, PDFs and images can be dragged and dropped into the folder, and then flicked

through like sheets of paper. Items can be filed under different tabs, and reordered, with the software automatically creating a detailed table of contents that's updated when documents or tabs are shuffled around.

Copies of web pages can also be saved into binders, simply by entering the URL, from which an offline copy of the page is stored. Irritatingly, emails can't be dragged and dropped into gDoc Binder, although it does include a basic text editor into which the text of emails can be pasted.

For all its simplicity, gDoc Binder is held back by a few fundamental flaws. Performance is laboured: the animated flicking was juddery on our test 1.7GHz Core i5 laptop with 4GB of RAM; importing a ten-slide presentation



» **gDoc Binder allows you to flick through virtual folders with ease**

dragged the PC to its knees and took more than two minutes. The orientation of binders is also fixed, meaning landscape images filed inside a portrait binder are rotated by 90 degrees. The lack of autosave is disappointing, too.

While the initial price of \$10 (around £6.50) seems like a bona fide bargain, it buys you only ten virtual binders; each additional set of ten costs another \$10, which grates slightly given there's no incremental cost to the company. What's more, deleting unwanted

folders doesn't return a binder to your allocation – each new binder created cuts your quota by one.

As a simple, low-maintenance means of organising notes and documents, gDoc Binder has plenty going for it – but there are too many kinks to iron out before it can earn our full recommendation. **BARRY COLLINS**

<b>OVERALL</b>	★★★★★
<b>EASE OF USE</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★



PREVIEW

# Adobe Photoshop Lightroom 5

Substantial new features for laptop-wielding photographers and improved editing tools make Lightroom 5 a superb photo application



» **PRICE** Expected to be £75 (£90 inc VAT)  
» **SUPPLIER** [www.adobe.com](http://www.adobe.com)

**A**dobe pushed Lightroom towards the photography mainstream with a huge price cut for the launch of version 4 last year. There's nothing as dramatic with the release of Lightroom 5, but Adobe is further broadening the appeal of its raw processing and workflow suite.

Cannily, it has recognised that photographers are increasingly taking SSD-based MacBooks or Ultrabooks on shoots, which don't have the disk space for vast libraries of raw files. To address the problem, it has provided a clever way to allow photographers to keep full-resolution photos on external drives, while retaining the ability to edit these photos while travelling: Smart Previews.

These are high-resolution copies (up to 2,540 pixels on the longest edge) of raw or JPEG files, stored in Adobe's DNG format. Typically, they consume less than 1MB of disk space each, a tiny fraction of the 25MB or more raw files swallow up. You can set Lightroom to automatically create Smart Previews of every photo imported into its catalogue, or create them on demand for each batch of photos imported.

When you're sitting at your desk with the disk drive connected, any edits will be made on the original, full-resolution file;



Smart Preview allows laptop users to edit hi-res copies while disconnected from the original images

take the laptop out and you can perform edits on the Smart Previews, which are synced with the original files the next time you re-attach the external disk drive.

This synchronisation worked flawlessly in our tests, not only with raw files stored on external hard disks, but also on NAS drives (as long as you use network drive mapping). The DNG copies are of sufficiently high resolution to apply the vast majority of edits with confidence; you have to zoom in to 100% before you begin to notice the difference between Smart Previews and full-resolution files. The only time we felt nervous about Smart Preview edits was when trying to fudge the effect of sharpening and noise reduction

on high-ISO images, where there were more visible differences between the previews and the full-resolution images.

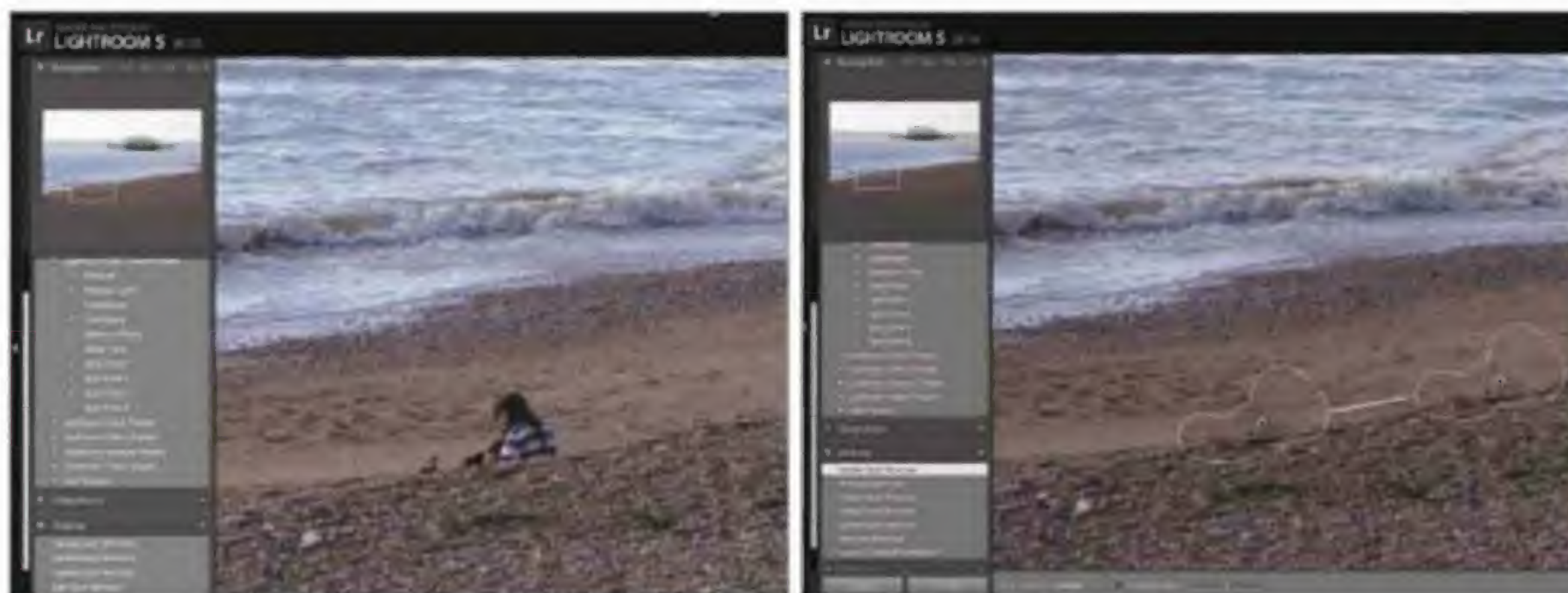
Adobe has once again beefed up the photo-editing tools in Lightroom. The biggest improvement comes in the form of the Advanced Healing Brush, a near replica of Photoshop's Content Aware Fill tool. This allows you to brush around irregular shapes, such as dog walkers ruining a landscape, and clone them out. It's a great deal more flexible than the circular Healing Brush in Lightroom 4, but it's erratic.

The Upright tool provides automatic straightening of images, and worked well on almost all of

our test shots – even on horribly wonky horizons, and images where the horizon was mostly obscured. A Radial Gradient tool enhances the basic vignette tools that were available in previous versions, allowing you to throw an ellipse around the subject of your photo and use the regular adjustment sliders (exposure, contrast, saturation and so on) to darken the rest of the photo.

Lightroom 5 also provides new ways to display your work. The suite makes it easier to customise photo books, and it's now possible to create video slideshows that combine both video and photos. These lack panache, however.

Overall, this is a steady but significant upgrade. Smart Preview alone could justify the upgrade for laptop users, while improved editing tools mean many photographers may even give Photoshop the heave-ho. Adobe couldn't confirm the price at the time of press, as it was still in late beta, but it will remain our A-List choice provided the price doesn't shoot up. **BARRY COLLINS**



Irregular shapes can be cloned out of images using Lightroom 5's Advanced Healing Brush

**OVERALL** ★★★★★  
**EASE OF USE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★



## A REFERENCE GUIDE TO OUR BENCHMARKS AND TEST METHODS



# Dell PowerEdge T320

A single-socket server with Xeon E5-2400 power, room to grow and very low noise levels. The PowerEdge T320 is a top choice for SMBs

» **PRICE** £1,476 exc VAT  
» **SUPPLIER** [www.dell.co.uk](http://www.dell.co.uk)

**S**ingle-socket Xeon E5 systems are an ideal upgrade for small businesses that need a new server, but there aren't many to choose from. Now, Dell adds another to the list with its PowerEdge T320, which is designed to provide SMBs with a good-value workhorse capable of running a wide range of applications.

Prices start at £499 for a model equipped with a basic 2.6GHz Pentium 1403 CPU, and you can upgrade to a 2.8GHz Xeon E5-1410 for around £200, or choose from a small selection of E5-2400 CPUs.

Our review system housed the slowest E5-2400 CPU in the family, the 1.8GHz Xeon E5-2403. It has four cores, a 10MB L3 cache and a 6.4GT/sec QPI, but memory speeds are limited to 1,066MHz, and neither Hyper-Threading nor Turbo Boost are supported.

The Xeon E5-2403 has a low TDP of 80W, which helped the Dell perform well in our power tests. With Windows Server 2012 idling, the review system drew a modest 68W from the mains. Under heavy load from the SiSoft

Sandra benchmarking app, that figure rose to only 81W.

Our system included the basic 350W cabled PSU (see 1), but it's possible to upgrade the system with dual PSUs for power redundancy. Dell offers dual 475W and 750W hotplug PSUs as a configurable option during the order process.

The PowerEdge is likely to be a hit with small offices that demand tranquillity: cooling is handled by a single 120mm fan at the rear that barely makes a sound. The T320 is also capable of surviving life in warmer offices, as it supports Dell's Fresh Air initiative: this means it's rated to operate safely in ambient temperatures of up to 40°C for 900 hours a year, and in temperatures of 45°C for 90 hours in the same period.

The T320 has oodles of storage potential. Our review system was fitted with the basic four-bay cold-swap cage, filled with a quartet of 500GB Enterprise SATA hard disks (see 2), and each drive was cabled directly to the motherboard's 3Gbits/sec SATA port and managed by the embedded PERC S110 RAID controller.

Those who need more storage aren't short of options. It's possible to upgrade to a front-loading eight-bay hot-swap LFF

cage, although it's worth bearing in mind that you'll need to shell out for a PERC PCI Express RAID card if you want to use all eight bays.

Businesses with a hunger for storage can also order the T320 with a 16-bay SFF hot-swap cage. The optional SFF cage supports SAS or SATA drives, and you can choose from pedestal- or rack-mount chassis configurations.

If decent remote management is high up on your shortlist, it's definitely worth upgrading from Dell's Basic Management option. The savings are tempting, but all you get is shared access to the first network port, and remote power controls via Dell's IPMISH command line utility; it's far better to cough up the extra £115 for the iDRAC7 card.

The iDRAC7 Express version provides remote web browser access and server monitoring, and shelling out a further £168 on the Enterprise upgrade (as found in our review system) enables full remote control and virtual media services.

Usefully, you can start with the Express card and upgrade later on: the dedicated network port and vFlash slot are already present on the Express card and can be enabled by entering a licence key. Both versions of the iDRAC7 interface allow you to monitor the Dell's Fresh Air operating temperature thresholds, albeit only on systems that have dual redundant PSUs.

Along with dual embedded Gigabit ports, there's plenty of room for further expansion: the motherboard provides five PCI Express slots (see 3). Dell offers upgrades to Nvidia Quadro 4000 or 6000 graphics cards for businesses planning on running apps such



» The T320's dual SD card controller makes it ideal for use as a virtualisation platform

as medical imaging, rendering or desktop virtualisation.

The T320 also makes for a great virtualisation platform. Dell's dual SD card controller – which provides automatic hypervisor redundancy by mirroring the contents of the primary boot card to the secondary card – remains unique to the PowerEdge range.

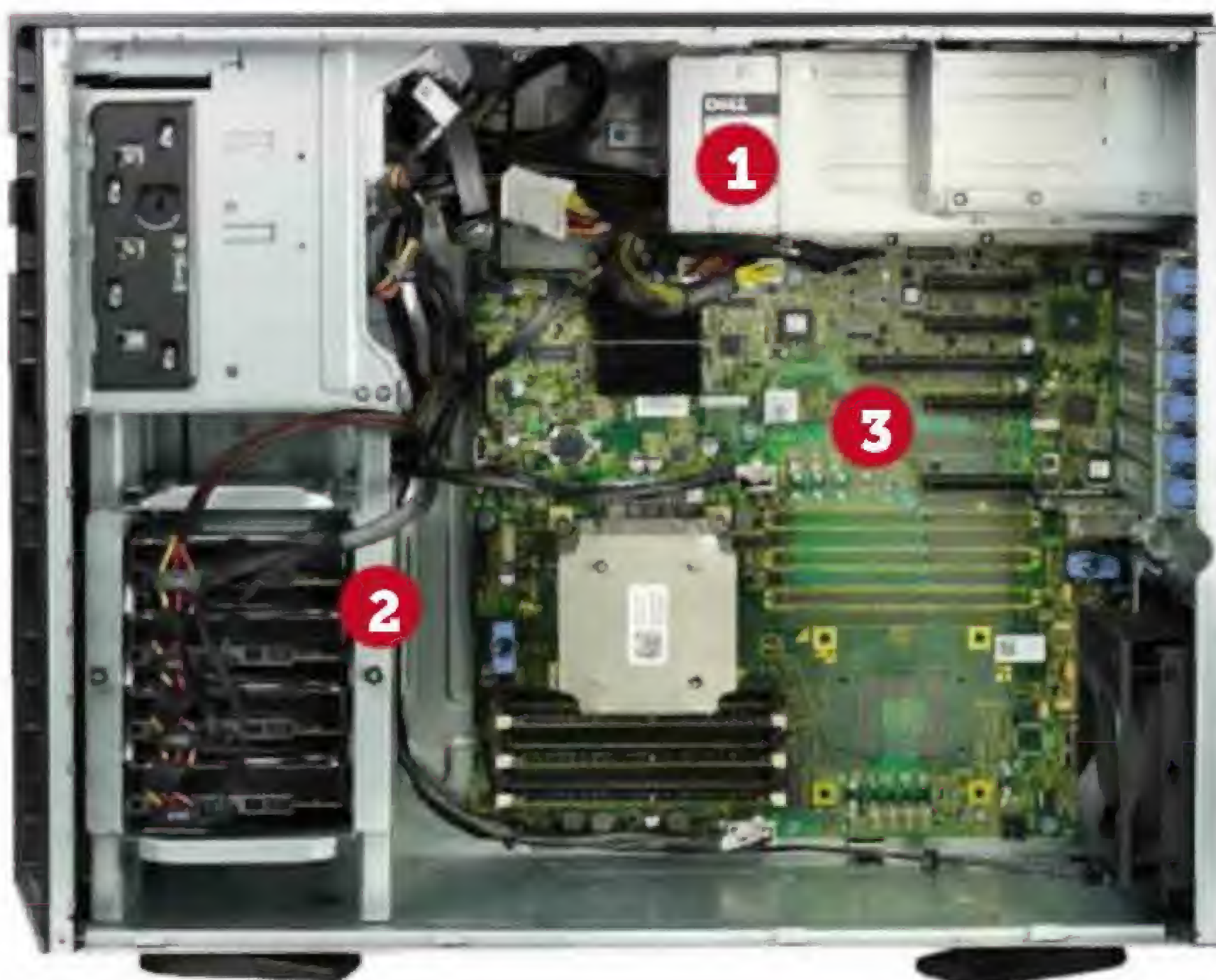
Dell's PowerEdge T320 has little in the way of rivals – neither HP nor IBM has anything in their portfolios to match it, and Lenovo offers only two Xeon E3 towers.

Small businesses that need a new server, but don't want the expense of dual sockets, will find the T320 fits the bill nicely. It delivers E5-2400 power at a reasonable price, has plenty of room to expand, and its low noise levels and solid build quality make it suited to life in a small office. **DAVE MITCHELL**

## KEY SPECS

Pedestal chassis with four internal cold-swap 3.5in drive bays • 1.8GHz Xeon E5-2403 • 12GB DDR3 RDIMM (max 192GB) • Dell PERC S110 embedded SATA controller • supports RAID0, 1, 5, 10 • 4 x 500GB Dell Enterprise SATA hard disks • 5 x PCI-E 3 slots • 2 x Gigabit Ethernet • 350W fixed PSU • Dell iDRAC7 Enterprise • 3yr on-site NBD after remote diagnostics warranty • Power: 68W idle; 81W peak

<b>OVERALL</b>	★★★★★
<b>PERFORMANCE</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★





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<sup>1</sup>Applicable to IBM System x3750 M4, x3650 M4, x3630 M4, x3550 M4, x3530 M4 and x3300 M4 server models with 95 Watt processors or below.

<sup>2</sup>HP ProLiant DL380p G8 supports up to 35 °C (Link: <http://www.storage-networks.com/documents/manuals/dl380p-gen8-manual.pdf>).

Dell PowerEdge R720 and R720xd support up to 40 °C at 10% of annual operating hours or less (Link: <http://support.dell.com/support/edocs/systems/per720/en/OM/r720omen.pdf>).

<sup>3</sup>Pricing quoted is based on IBM's 0% System x Solution Finance offering (FMV lease). Terms & Conditions apply. Offering availability subject to credit approval; for more details and full Terms & Conditions please visit: <http://www.ibm.com/financing/uk/lifecycle/acquire/xsolutionfinancing.html>

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EXCLUSIVE

# Boston Value Series 115T

The first AMD Opteron 3300 pedestal server to market delivers a high core count for the price – and fast storage, too

» PRICE £999 exc VAT  
» SUPPLIER [www.boston.co.uk](http://www.boston.co.uk)

**A**MD might not be a particularly popular choice with the blue-chip vendors, but Boston has always been a keen proponent of its Opteron chips. In this exclusive review, we bring you a first look at AMD's new Opteron 3300 Series processor in Boston's Value Series 115T pedestal server.

Based on AMD's "Piledriver" core, the three-strong Opteron 3300 family clearly has Intel's Ivy Bridge Xeon E3s in its sights, and all three CPUs tout impressively low power draws. The quad-core 1.9GHz Opteron 3320 EE has a minuscule 25W TDP; the quad-core 2.8GHz Opteron 3350 HE occupies the mid-range with a TDP of 45W; and the eight-core 2.6GHz Opteron 3380 – with which Boston has equipped its 115T – has a 65W TDP. All the chips have an 8MB L3 cache and fit AMD's AM3+ socket, so if you already have an Opteron 3200 system, you can use these as drop-in upgrades.

On paper, the AMD Opteron 3380 matches Intel's Xeon E3 v2s in the power department – all

Intel's quad-core variants have TDPs ranging from 45W to 87W. In our power tests, the 115T acquitted itself well, drawing only 56W with Windows Server 2012 in idle, and 108W under heavy load from the SiSoft Sandra benchmarking app.

The peak figures are higher than those of Supermicro's RTG RX-M140i (web ID: 378466) – featuring a 3.3GHz Xeon E3-1230 v2, it peaked at only 80W under heavy load – but this isn't a like-for-like comparison. When you consider that the 115T offers double the number of physical cores and twice the RAM, and has two hard disks rather than one, it doesn't look so greedy.

The price includes a generous 16GB of unbuffered 1,600MHz DDR3 memory, too, and the four RAM slots support a maximum of 32GB (see 1). Boston has supplied a pair of 8GB DIMMs, so you can go right to the max without having to replace them.

In terms of dimensions, the 115T is a compact pedestal server that will sit comfortably on the desktop (or under it). For physical security, you can padlock the side panel shut, or use the chassis' Kensington lock.

The internal design is tidy. Cooling is handled by an 80mm

fan at the rear (see 2) and an active heatsink on the CPU, and, while we noticed the chassis fan speeding up on occasion, noise wasn't an issue: this server is extremely quiet, and well suited to a small office.

The 115T is well endowed in the storage department. The Supermicro H8SML-7F motherboard sports a 6Gbits/sec LSI 2308 SAS2 controller, which provides eight available ports next to the removable four-bay disk cage (see 3). The cage can be released and swung round for access, and each drive is mounted in lightweight plastic sleds. The price includes a pair of 3Gbits/sec 1TB WD Enterprise SATA II hard disks. If anything is lacking, it's that the LSI chip's RAID support extends to only mirrors and stripes.

The AMD SP5100 chip offers a further six SATA II ports and support for RAID mirrors and stripes – but, disappointingly, you can't use them on this server: the ports are side-mounted at the bottom of the motherboard, and access is blocked by the base of the chassis. An embedded power connector is also provided for a SATA DOM, but since it's right next to the obstructed SATA ports, it too goes wasted.

The 115T redeems itself elsewhere. It's capable of functioning as a virtualisation test platform, since it has an internal USB port for booting into a hypervisor, and the motherboard provides Supermicro's embedded IPMI controller and dedicated network port for remote management. Compared with the likes of HP's iLO4, the web console is basic, but it isn't ineffective: it displays data from the motherboard's sensors, and can issue SNMP traps and email alerts if preset thresholds are breached.



• The Value Series 115T has an internal USB port for booting into a hypervisor

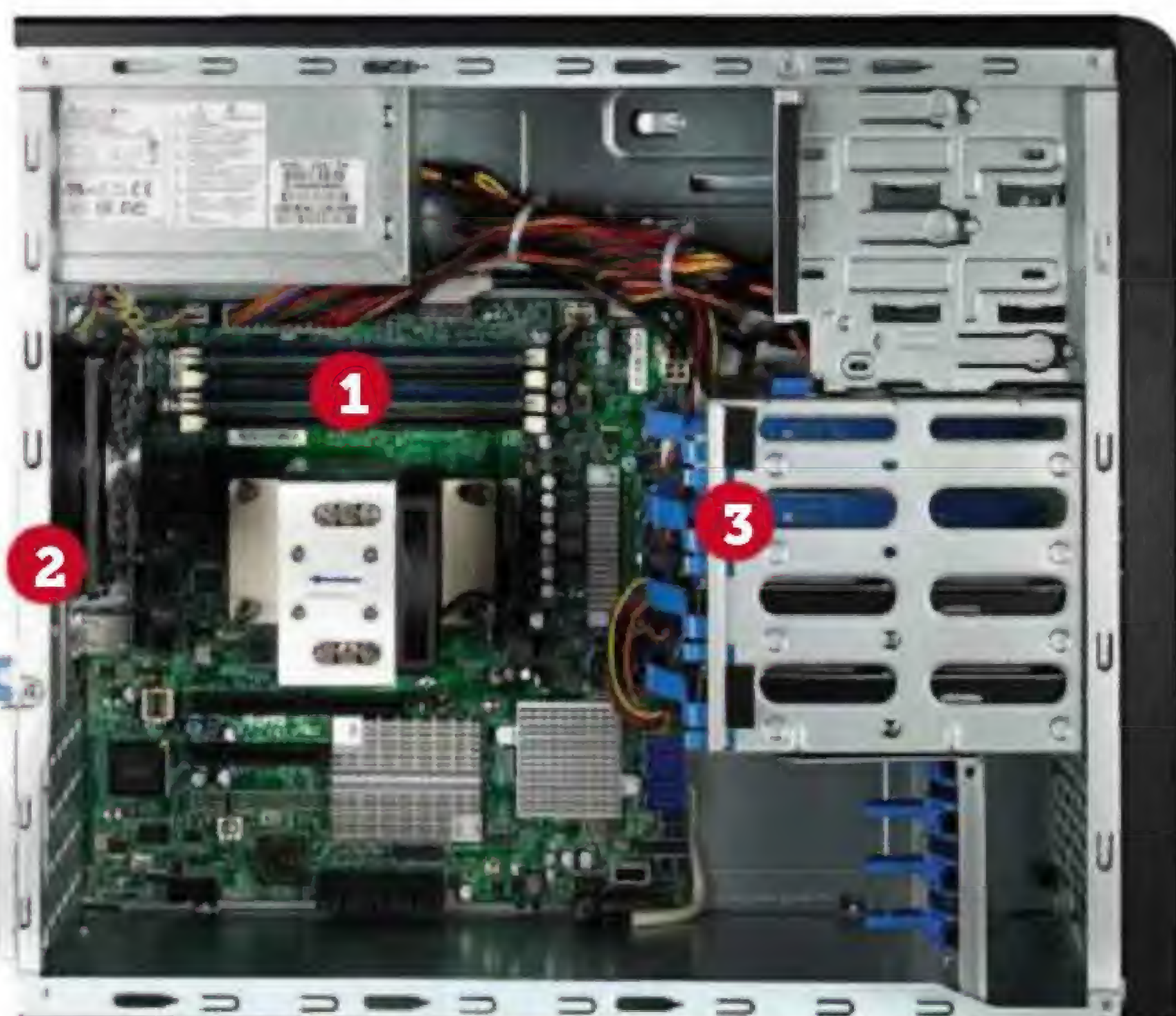
Full control over power is provided, too, so you can remotely power the server off and on, reset it, and gracefully power it down. You also get full remote control and virtual media services included as standard – features vendors such as HP offer only as an optional upgrade.

With so few server manufacturers embracing the Opteron 3300 CPUs, it's impossible to make a direct comparison with the Value Series 115T. What we can say, however, is that it stacks up well against the Xeon E3-equipped Dell PowerEdge T110 II (web ID: 369607). The 115T costs a similar sum but offers double the CPU core count, a fast SAS2-embedded disk controller, and superior remote management features. All in all, this pedestal server should definitely make your shortlist. **DAVE MITCHELL**

## KEY SPECS

Pedestal chassis • Supermicro H8SML-7F  
motherboard • 2.6GHz AMD Opteron 3380 • 16GB  
1,600MHz DDR3 (max 32GB) • LSI 2308 SAS2  
8-port controller • supports RAID0, 1, 10 • 2 x 1TB  
WD Enterprise SATA II cold-swap hard disks (max 4) •  
2 x Gigabit Ethernet • 2 x PCI-E • IPMI with 10/100  
port • 290W cabled PSU • 3yr on-site NBD warranty  
• Power: 56W idle; 108W peak

<b>OVERALL</b>	★★★★★
<b>PERFORMANCE</b>	★★★★★
<b>FEATURES &amp; DESIGN</b>	★★★★★
<b>VALUE FOR MONEY</b>	★★★★★





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**T**he Bring Your Own Device (BYOD) trend is putting many businesses in a real dilemma – they can't afford to ignore its productivity benefits, but have grave concerns about security.

UK start-up SaaSID has a novel approach to this problem: its Cloud Application Manager (CAM) uses a lightweight software agent that plugs into the user's browser. It also provides freely available software for iOS devices.

Agent deployment is swift and simple: it can be pushed silently to end points, or emailed as a link to users. For testing purposes, we focused on Google Chrome and had the CAM extension loaded in seconds.

The CAM admin portal is well designed and easy to use. We added our users and groups manually, but most businesses will want to use CAM's support for Active Directory synchronisation via LDAP. Limited administrative rights can be assigned to selected users, allowing some admin

functions to be delegated. Six different options are provided, and include application, audit and user management.

From the System menu, you have two options for controlling user logins. The In-line Login forces users to authenticate with CAM only if they want to access controlled web apps. This allows them to go to other websites without authenticating, but it means CAM can't audit all their web activity.

Forced Login, on the other hand, redirects users to the CAM portal the moment they load a web browser. They aren't allowed to visit any website until they've been authenticated, and CAM can audit all their web access.

The process of application enrolment is implemented brilliantly. As an administrator, you visit the site hosting the web app you want to control and navigate to its standard login page. You then click the CAM cloud icon and choose the Application Admin option. It will display an enrolment page in the lower-right corner; here you can edit the name of the web app, the domain and the landing page details, assign an application category, and enable authentication. Next, you click on



From the CAM admin portal, you can view enrolled web apps and strictly control access to each one

the username box in the web page and select Choose in the CAM window. This enters the relevant details for you and highlights the box in red. Do the same for the password box and you're done. Moving to the admin portal shows the new app is ready and waiting to be controlled. By default, all user and group access is blocked – you can toggle this on and off.

Enabling authentication controls for a web app activates SSO enrolment. The user enters their normal credentials at the next login, after which CAM changes them and stores them securely in the cloud. When the user next selects the web app from their CAM portal, all login details are handled transparently.

This solves two problems: users no longer know their login details, so they can't write them

down or circumvent CAM; and they can't access web apps or sites from an unprotected device.

Built-in data-leakage controls allow you to decide what web page components or fields are presented to the user. This makes it possible to disable functions, such as data export, and block specific financial data from being shown in Salesforce, while Facebook access can be controlled down to each individual function.

CAM Analytics provides customisable pages with detailed information about individual web apps and all user activities. Speedometer dials and graphs keep you in the loop on web app usage, and you can also monitor non-productive web access.

From here, you can monitor all website access per user, check on Salesforce activities, such as failed or good logins and exported reports, and drill down into each application report for more detailed information.

It all amounts to a compelling package. Cloud Application Manager is a sophisticated means of controlling web-app usage, and it's capable of extending strict security policies to BYOD users. Deployment is remarkably simple, the management portal is well designed and, most appealingly of all, it's an affordable solution for SMBs. **DAVE MITCHELL**



The CAM Analytics portal provides a wealth of data on the activity of users and web apps

**OVERALL** ★★★★★  
**EASE OF USE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★





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# Qnap TS-870U-RP

An eight-bay rack-mount NAS unit offering power redundancy and lots of features

» **PRICE** Diskless, £1,466 exc VAT  
» **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

**Q**nap's latest NAS appliance has finally brought 10GbE performance to a price point SMBs can afford. The TS-870U-RP is an eight-bay rack-mount appliance that provides a couple of PCI Express expansion slots, which support a wide range of optional 10GbE adapters.

The TS-870U-RP crams in a huge amount for the money. There are dual 300W redundant power supplies, a 6Gbits/sec SATA III disk controller, and 4GB of DDR3 memory (which can be upgraded to 16GB). The price is

kept down by removing the LCD and operator panel at the front and using a basic 2.4GHz Intel Celeron G530 CPU.

For speed testing, we installed three 4TB WD Enterprise SATA III drives and used Qnap's slick web interface to create a RAID5 array. We then linked the appliance to Dell PowerEdge R515 and Broadberry dual-Opteron 4100 rack servers, and used Emulex OCE11102-NM 10GbE dual-port adapters on all three systems.

With a Windows share mapped to the Dell server, Iometer reported raw read and write speeds of 950MB/sec and 825MB/sec. We then ran Iometer on a second share mapped to the Broadberry server, and saw

◉ **The TS-870U-RP includes dual 300W redundant power supplies**

cumulative read and write speeds soar to 1,685MB/sec and 1,052MB/sec respectively.

These results translate to seriously fast real-world speeds: drag-and-drop copies of a 2.52GB video clip returned read and write speeds of 310MB/sec and 282MB/sec, and FTP speeds, using FileZilla, increased to 365MB/sec and 306MB/sec respectively. Performance bodes well for general backup

operations, too, as our 22.4GB collection of 10,500 small files was copied to the appliance at a rate of 112MB/sec.

Qnap's DSM firmware has now reached version 3.8, but most of the additions are multimedia toys rather than business-focused additions. These comprise the new DJ Station, Video Station and TV Station, plus updates to Photo Station and Music Station 3. Surveillance Station Pro has



# TP-Link SafeStream TL-ER6120

Good VPN support, plus WAN load-balancing and failover, but performance is below par

» **PRICE** £147 exc VAT  
» **SUPPLIER** [www.ebuyer.com](http://www.ebuyer.com)

**T**P-Link has a reputation for low-cost networking products, and its latest VPN router is no exception. For just over £147, the SafeStream TL-ER6120 supports up to 100 IPsec VPN tunnels; it has dual Gigabit WAN ports that can be used for load balancing or backup links; and security extends to service blocking, application controls and website filtering.

It's well connected, too. The 1U rack chassis has three Gigabit LAN ports, and the third can provide DMZ services for multiple public servers.

There's an RJ45 console port for direct management access via the CLI, and the router is prepped against lightning thanks to its built-in electrical surge protection.

For installation, there's no need to use the CLI; the router's web interface provides easy access to all features. Its

firewall protects against common flood attacks and malformed packets, and it also has an option for MAC address filtering.

The firewall's URL filtering is no different to that offered by most consumer routers – you can only apply manually created lists of keywords. You can use access rules to block or allow specific services, however, and each policy can be run to a daily schedule.

Policies and schedules can also be used to block or permit a range of IM and P2P apps. You can't add your own apps, though, and the list provided by TP-Link only

covers only 25 common apps such as MSN, Skype, BitTorrent and YouTube.

Bandwidth policies can be applied to port pairs to control traffic in a particular direction, and each policy can enforce guaranteed minimum upstream and downstream bandwidths. For WAN load balancing, you can have application-optimised routing, where all packets with the same source and destination IP addresses are sent through the same WAN port.

Once you've set the bandwidth capacities for each WAN port, you can use balancing based on traffic loads. Creating backup



◉ **The TL-ER6120 has three Gigabit LAN ports, the third of which can provide DMZ services**



The TS-870U-RP's IP SAN features are among the best. Thin provisioning is included, along with iSCSI LUN backup to a remote storage location over CIFS or NFS. Qnap offers a wide selection of freely available add-in packages, too, with ClamAV providing options to run antivirus scanning on selected folders.

2U rack chassis • 2.4GHz Intel Celeron G530 • 4GB  
DDR3 (max 16GB) • 512MB DOM • 8 x hot-swap  
3.5" bays • SATA drive bay • 1 x SATA RAID0,  
SuperPLS III • 16GB cache • 64GB storage  
• Super I/O • Hotswap • 180W • 2 x Gigabit Ethernet  
802.11n Wi-Fi • Onboard 2G • 3.2mm repeater  
• 4 x USB 3 • 4 x USB 2 • 2 x eSATA • 2 x FireWire  
• 2 x DVI-D camera • On-board video • Headset Replicator  
• 75 W • 6 x 75 mm fans • 50% power  
and O&P software • 3YR R/W warranty

With an IPsec VPN tunnel setup between a remote Windows 7 PC and the router, we timed drag-and-drop copies to a mapped share on a Windows Server 2012 system on the LAN. Copying a

1U rack chassis • 5 x Gigabit Ethernet (2 x LAN, 1 x LAN/DMZ, 2 x WAN) • RJ45 console • supports 100 IPsec VPN tunnels • internal surge-protected power supply • 1yr RTB warranty • Options: five-user licence for TheGreenBow IPsec VPN client. £213 exc VAT

Overall	★★★★★
Performance	★★★★★
Features & Design	★★★★★
Value for Money	★★★★★

OVERALL	★★★★★
PERFORMANCE	★★★★☆
FEATURES & DESIGN	★★★★★
VALUE FOR MONEY	★★★★★

- Desktop chassis
- Gigabit Ethernet
- 2 x HDMI
- 4 x USB 2
- 3.5mm audio out
- 24 channels (240fps@720p)
- max resolution 1080p
- supports MJPEG, MPEG4, H.264
- external power supply
- local management via HDMI monitor
- 3yr RTB warranty
- 71 x 224 x 166mm (WDH)

A black Synology DS240C+ network storage device. The front panel features a vertical strip of status lights labeled 'STATUS', 'LAN', and 'LOCK'. The Synology logo is prominently displayed on the right side of the front panel. The device has a sleek, rectangular design with rounded edges and a matte finish.

OVERALL	PERFORMANCE	FEATURES & DESIGN	VALUE FOR MONEY
★★★★★	★★★★★	★★★★★	★★★★★



# Fujitsu ScanSnap iX500

A fast desktop scanner that's good value, extremely easy to use and includes support for wireless mobile devices

» **PRICE** £300 exc VAT  
» **SUPPLIER** [www.lambda-tek.com](http://www.lambda-tek.com)

**F**ujitsu's ScanSnap iX500 is as multitasking as desktop scanners come. It touts fast scan speeds, USB 3 connectivity, and wireless support for scanning directly to mobile devices.

The iX500 feels sturdy, and its flip-up ADF has room for 50 sheets. The single blue button at the front is all that's needed for most scan operations, and a small

## KEY SPECS

600dpi optical resolution • 25ppm @ 300dpi colour colour • 25ppm @ 600dpi mono • 50-sheet ADF • USB 3 • 802.11bgn Wi-Fi (mobile devices only) • external power supply • USB 3 cable • ScanSnap Manager 6, ScanSnap Organizer 5, CardMinder 5, ABBYY FineReader 5, Adobe Acrobat X Standard software • 2yr advanced exchange warranty • 292 x 159 x 168mm (WDH)

LED alongside shows the wireless connection status.

For PC-based scanning, you have to rely on the Fujitsu's USB connection. We had no problems installing the iX500 on a Windows 7 PC, and the ScanSnap Manager utility provides a menu for fast access to your favourite apps.

A wizard enables wireless access, displays all the networks within range, and assists with connecting to the selected AP. It also aids in connecting iOS and Android mobile devices running the ScanSnap Connect app.

Profiles created in ScanSnap Manager define destinations and applications, and each can be assigned with specific scan quality settings. File output is limited to PDF or JPEG file formats, however, and there's no TWAIN or ISIS driver.

» **The iX500's USB 3 connection makes for fast scan speeds**

The iX500 is easy to use. Pressing the blue button begins scanning and, once finished, the Quick Menu provides a range of destinations, including email, folders, printers, Office apps, custom apps or one of the bundled applications.

We were also able to send scans directly to our local Dropbox folder and Google Drive account. Other options include Evernote, Salesforce Chatter and Microsoft SharePoint.

For most scan tasks, the iX500 hits its claimed 25ppm speeds in our tests: a duplex scan of a 25-page sheaf took 54 seconds at Normal, Better and Best settings.



Speeds slowed only when we used the Excellent setting for 600dpi colour scans, with our tests confirming the quoted speed of 7ppm. Quality is perfectly acceptable, and it's quiet, too.

Fujitsu's desktop scanner is nippy, easy to use and packed with useful features. It's ideal for small or home offices. **DAVE MITCHELL**

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★

# Canon i-Sensys MF4890dw

A low-cost mono MFP that combines fast print speeds with a useful array of features

» **PRICE** £196 exc VAT  
» **SUPPLIER** [www.printerbase.co.uk](http://www.printerbase.co.uk)

**S**itting at the top of Canon's family of small-office mono MFPs, the MF4890dw allies 25ppm print speeds with useful features such as Canon's 50-page duplex automatic document feeder (DADF), which can scan both sides of a page for copy, fax and scan operations.

Network installation is easy, and the setup routine also loads Presto's PageManager 7, and

## KEY SPECS

1,200 x 600dpi A4 mono laser • 25ppm • 600dpi colour scanner • 128MB RAM • USB 2 • 2 x RJ11 • Ethernet • 33.6Kbits/sec fax/modem • 802.11bgn Wi-Fi • 250-sheet cassette • single-sheet manual slot • 50-sheet DADF • monthly duty cycle 10,000 pages • 1yr RTB warranty • 390 x 445 x 360mm (WDH)

Canon's Toolbox and network scan utilities. The Toolbox's floating menu allows for quick scans to OCR, PDF and email, while the network scan utility registers the host PC with the MFP for direct scanning to the desktop.

Wireless setup must be run from the Canon's operator panel, but it's quick: a WPS-assisted connection to our Netgear router was created in seconds. Wired and wireless components can't be active simultaneously, though.

For fax operations, you can manually add address book entries from the printer's basic web interface. Canon's import/export software tool is handy for larger address books, but this only works with a local USB connection.

Scanning to a PC is easy, since all PCs that have the network

» **A duplex ADF makes light work of scans and copies**

utility installed appear in the LCD panel for selection.

The MF4890dw matched its claimed print speeds. A 25-page A4 Word document took one minute, and duplex prints emerged at 16ppm. Our challenging 24-page DTP document printed in 56 seconds, but copying a ten-page double-sided document using the DADF averaged at a sluggish 4ppm.

Speed remained constant across both the printer driver's General and Publication quality settings, and there were no significant differences in output. Text remained pin-sharp, and, while



photos lost detail in darker areas, there was minimal banding.

The MF4890dw is packed with features and delivers nippy print speeds – and the DADF is a boon. For only £196, Canon has put together a solid package at an appealing price. **DAVE MITCHELL**

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★



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# Bin your ISP router

Most major ISPs supply a router for free when you sign up to their broadband services, but are those units holding back your Wi-Fi speeds? We've pitched BT, Sky and Virgin Media's offerings against nine third-party routers to find out if it's worth switching

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# Buyer's guide



**I**SP-supplied routers, like other areas of the wireless industry, have been steadily improving over the years. Once, they were hardly worth the plastic and precious metals from which they were made, but they now offer better performance, and some unique and interesting features.

Sky and BT offer channel-hopping interference-dodging in their routers, while Virgin Media combines cable modem and 5GHz support in its bundled offering.

So, why should you make the switch? What makes a third-party router deserving of your cash? The answers are threefold: features, flexibility, and vastly increased wireless speed and coverage.

Despite those improvements, the ISP-supplied routers are basic devices. Only one has a USB socket (useful for sharing storage, or networking printers). None of them have advanced, router-centric, category-based parental controls. And none of them offer smartphone or tablet apps for router and network management. The best third-party routers take all this in their stride.

They're also limited when it comes to flexibility. None of the ISP routers support concurrent dual-band networks, essential if you want to connect older devices as well as benefit from the increased speed and stability of 5GHz networking. None make it particularly easy to access the router remotely, either, whereas D-Link, Asus and Cisco Linksys

all have their own dynamic DNS services that make it a doddle.

All the ISP-supplied routers we've tested this month are locked to their respective broadband services, too. Even if you did want to take them elsewhere, there's no way to do it. Contrast that with the Netgear routers in this Labs, which can be used on both ADSL and cable connections. Even the single-connection routers reviewed in this Labs can be carted from service to service.

And, of course, you only get access to the latest technology – namely 802.11ac – if you opt for a third-party router. We have three routers with this onboard in the Labs this month, and they all promise superfast wireless speeds of up to 1.3Gbits/sec. The new standard can achieve these results by supporting wider channels in the 5GHz spectrum (up to 160MHz versus 40MHz) and more MIMO spatial streams. Although 802.11ac is still under development (it's at the draft 5 stage), these routers are still backwards-compatible with 802.11n devices, so early adopters aren't negatively impacted.

Whether or not you opt for the latest technology, though, there are some fantastic wireless routers reviewed in this Labs that have the potential to super-charge your wireless network, and whisk a high-speed broadband connection to every corner of your home. If you don't make the switch, you'll never know what you're missing.

## HOW WE TEST

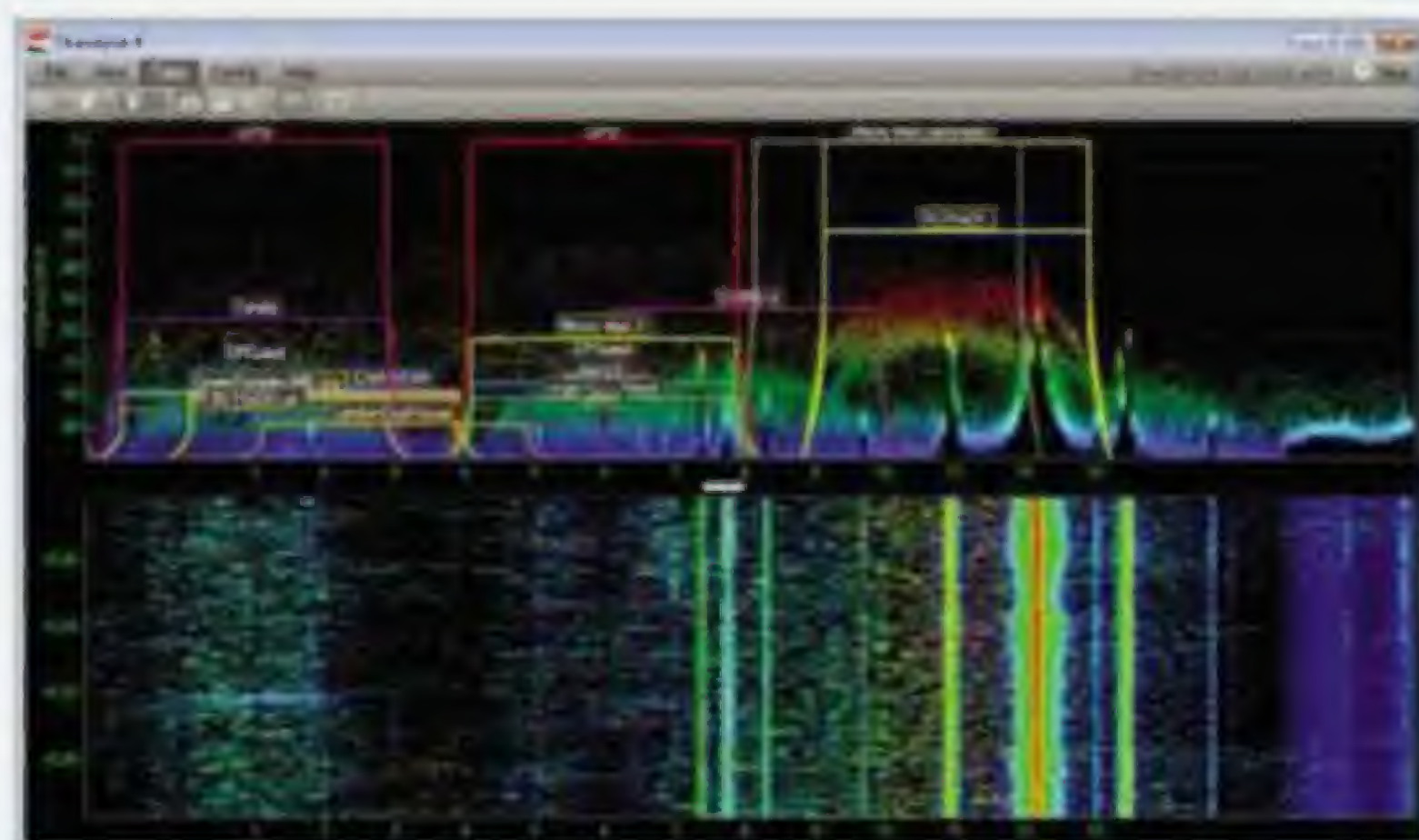
Testing wireless routers is tricky. Not only do we need to provide an idea of how fast a router can be, but we also need to be able to indicate how well it performs at short and long ranges, and test performance in both the 2.4GHz and 5GHz frequency bands.

To test these elements, we use two laptops running Windows 7: one connected to the test router via a wired connection to eliminate bottlenecks, and the other connected via wireless, using the 3x3 MIMO stream-capable Intel WiFi Link 5300 chipset. We then set up each router to use WPA2 security with AES encryption and, if possible, enable channel bonding to ensure maximum performance.

To assess speed, a series of large and small files is copied between Windows shares on the two laptops. We run these tests in the 2.4GHz frequency band, then over 5GHz at a range of 2.5m, to assess top speed. For the 802.11ac routers, we test again using the manufacturer's own 802.11ac USB adapter; none of the manufacturer's USB adapters could complete the long-range test, though, which is why you won't see the figures in the feature table.

Next, we repeat the tests in each frequency band, and over 802.11ac, with the wireless laptop placed at a distance of 40m from the router, with one 19mm-thick wooden wall and a double-glazed window in the way. This test indicates how each router performs at long range. There's a full breakdown of speed figures in the feature table (*see p142*) and graphs (*see p152*).

During testing, we monitor the airwaves using another laptop equipped with a Wi-Spy DBx radio-frequency spectrum analyser. Supplied by MetaGeek ([www.metageek.net](http://www.metageek.net)), this allows us to ensure each router is using the optimum channel, and that no other devices in the vicinity are causing interference. Where available, we test the speed of each device's shared-storage feature. Using a portable USB 3 hard disk as the source, we connect a laptop to an Ethernet port on the router, and use Iometer to assess raw speed. Finally, we test for ADSL speed and reliability. Using a DSLAM (the type of device your router talks to in the local telephone exchange) loaned to us by DrayTek, we set up our own virtual private ISP, then carry out a series of small- and large-file downloads and uploads over an FTP link, measuring the speed.



**The Wi-Spy DBx allows us to monitor the RF output of neighbouring networks and other devices**



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PRTG Network Monitor is once again listed on the PC Pro Enterprise A-list in the category 'Network Monitoring'.





	LABS WINNER					
	Asus DSL-N55U	Belkin AC 1200 DB	Belkin Play N600	BT Home Hub 3	Cisco Linksys EA2700	D-Link DIR-845L
Overall	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Performance	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features & Design	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value for Money	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
<b>Pricing</b>						
Part code	DSL-N55U	F9J1106v1	F9J1102v1	N/A	EA2700-UK	DIR-845L/B
Price (inc VAT)	£85 (£102)	£150 (£180)	£80 (£96)	Free with a BT Broadband package	£70 (£84)	£76 (£92)
Supplier	www.broadbandbuyer.co.uk	www.currys.co.uk	www.broadbandbuyer.co.uk	www.bt.com	www.broadbandbuyer.co.uk	www.broadbandbuyer.co.uk
Dimensions inc antennae (WDH)	206 x 185 x 157mm	204 x 75 x 217mm	204 x 75 x 217mm	183 x 60 x 108mm	173 x 189 x 29mm	95 x 119 x 190mm
Warranty	3yr RTB	2yr RTB	2yr RTB	1yr RTB	2yr RTB	1yr RTB
<b>Core specifications</b>						
Internet connection type	ADSL2/2+	ADSL2/2+	ADSL2/2+	ADSL2/2+, BT Infinity (requires separate modem)	Cable	Cable
Dual band (2.4GHz/5GHz)	✓	✓	✓	✗	✓	✓
Concurrent dual band	✓	✓	✓	✗	✓	✓
Wireless standards	802.11abgn	802.11abgn+ac	802.11abgn	802.11bgn	802.11abgn	802.11abgn
Maximum throughput (2.4GHz/5GHz)	300/300Mbps/sec	300/867Mbps/sec	300/300Mbps/sec	2.4GHz, 300Mbps/sec	300/300Mbps/sec	300/300Mbps/sec
40MHz channels (2.4GHz/5GHz)	✓/✓	✓/✓	✓/✓	✓/✗	✓/✓	✓/✓
Gigabit Ethernet ports	4	✗	✗	✗	4	4
10/100 Ethernet ports	✗	✗	4	4	✗	✗
USB ports (device support type)	2 (storage, printer, 3G/4G dongle)	2 (storage, printer)	1 (storage, printer)	1 (storage)	✗	1 (storage)
<b>Security and parental controls</b>						
Security types	WEP, WPA (personal, enterprise), WPA2 (personal, enterprise), Radius	WEP, WPA (personal, enterprise), WPA2 (personal, enterprise)	WEP, WPA (personal), WPA2 (personal)	WEP, WPA (personal), WPA2 (personal)	WEP, WPA (personal, enterprise), WPA2 (personal, enterprise)	WEP, WPA (personal, enterprise), WPA2 (personal, enterprise)
Web content filtering	✗	✓ (via Norton)	✗	✗	✗	✓ (via OpenDNS)
URL whitelisting	✗	✗	✗	✗	✗	✓
URL blacklisting	✓	✓	✓	✗	✓	✓
Schedule-restricted internet access	✓	✓	✓	✗	✓	✓
WPS button/router PIN/device PIN support	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✗/✓
<b>Other</b>						
IPv6 support	✓	✓	✗	✓	✓ (with 6rd)	✓
Wireless repeater functions	✗	✗	✗	✗	✗	✓
Wireless on/off switch	✓	✗	✗	✗	✗	✗
Power switch	✓	✗	✗	✓	✓	✓
User-configurable QoS	✓	✓	✓	✗	✓	✓
Media server	✓	✓	✓	✗	N/A	✓
Torrent server	✗	✗	✗	✗	N/A	✗
Storage format support	FAT16, FAT32, NTFS	FAT16, FAT32, NTFS	FAT16, FAT32, NTFS	FAT16, FAT32	N/A	FAT32, NTFS
Guest network	✓	✓	✓	✗	✓	✓
Android/iOS app	✓	✗	✗	✗	✓	✓
Extendability via apps	✗	✗	✗	✗	✓	✗
Online firmware updating	✗	✓	✓	✓	✓	✓
<b>Measured average speeds (MB/sec)</b>						
2.4GHz short range	13.6	8.2	5.8	5	14	8.1
5GHz short range	16.5	10.6	6.5	N/A	FTC	14.6
802.11ac short range	N/A	18.9	N/A	N/A	N/A	N/A
2.4GHz long range	6.3	4.5	3.8	4.1	5.5	4.9
5GHz long range	3.1	2.2	1.4	N/A	FTC	FTC
USB speed (wired)	12.2	2.9	2.3	3.6	N/A	7.1
ADSL download (wired)	2.4	1.1	2.3	UTT	N/A	N/A

Key: FTC – failed to complete test; UTT – unable to test





			RECOMMENDED		
DrayTek Vigor 2710n	Edimax BR-6478AC	Netgear D6300	Netgear DGND4000	Sky Hub	Virgin Media Hub
★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
V2710N	BR-6478AC	D6300-100UKS	DGND4000-100UKS	SR101	VMDG480
£101 (£121)	£125 (£150), includes EW-7822UAC adapter	£135 (£162)	£80 (£96)	New customers, free; upgrade, £57 (£69)	Free with all Virgin Media contracts
www.broadbandbuyer.co.uk	www.ebuyer.com	www.broadbandbuyer.co.uk	www.broadbandbuyer.co.uk	www.sky.com	www.virginmedia.com
216 x 47 x 278mm	195 x 134 x 141mm	255 x 67 x 197mm	160 x 76 x 159mm	140 x 53 x 141mm	193 x 74 x 203mm
2yr RTB	2yr RTB	1yr RTB	1yr RTB	1yr RTB	Lifetime
ADSL	Cable	ADSL and cable	ADSL and cable	ADSL2/2+	Cable
✖	✓	✓	✓	✖	✓
✖	✓	✓	✓	✖	✖
802.11abgn	802.11abgn+ac	802.11abgn+ac	802.11abgn	802.11bgn	802.11abgn
2.4GHz, 300Mbps/sec	300/867Mbps/sec	300/1,300Mbps/sec	300/450Mbps/sec	2.4GHz, 144Mbps/sec	300/300Mbps/sec
2.4GHz, ✓	✓/✓	✓/✓	✓/✓	2.4GHz, ✖	✓/✓
✖	4	4	4	✖	4
4	✖	✖	✖	4	✖
1 (storage, printer)	✖	2 (storage, printer)	2 (storage, printer)	✖	✖
WEP, WPA (personal), WPA2 (personal)	WEP, WPA (personal, enterprise), WPA2 (personal, enterprise)	WEP, WPA (personal), WPA2 (personal)	WEP, WPA (personal, enterprise), WPA2 (personal, enterprise)	WEP, WPA (personal), WPA2 (personal)	WEP, WPA (personal, enterprise), WPA2 (personal, enterprise)
✓ (via DrayTek GlobalView)	✖	✓ (via OpenDNS)	✓ (via OpenDNS)	✖	✖
✓	✖	✖	✖	✖	✖
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✖
✓/✖/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✖/✖	✓/✓/✖
✓	✖	✓	✓	✖	✖
✓	✓	✓	✓	✖	✖
✓	✓	✓	✓	✖	✖
✓	✖	✓	✓	✖	✖
✓	✓	✓	✓	✖	✖
✖	N/A	✓	✓	✖	✖
✖	N/A	✖	✖	N/A	✖
FAT16	N/A	FAT16, FAT32, NTFS	FAT16, FAT32, NTFS	N/A	N/A
✓	✓	✓	✓	✖	✓
✖	✖	✓	✓	✖	✖
✖	✖	✖	✖	✖	✖
✖	✖	✓	✓	✖	✓
9.4	18.1	9	13.8	7.7	13.4
N/A	18.7	26.6	17.8	N/A	13.7
N/A	21.6	25.1	N/A	N/A	N/A
4.7	5.9	5.8	1.9	0.3	2.7
N/A	FTC	4.4	2.2	N/A	FTC
F TC	N/A	17.8	14.1	N/A	N/A
2.3	N/A	2.1	2.1	UTT	N/A





## Asus DSL-N55U

A good price and superb performance in all departments mean that Asus' ADSL dual-band router clammers to the top of the pile



» **PRICE** £85 (£102 inc VAT)  
 » **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

**A**sus walked away with a Recommended award from our last wireless routers Labs; this time around, it's gone one better and swung the overall award. The reasons behind this are largely the same.

First, despite a reasonable price, the router has plenty of features. There's dual-band, concurrent Wi-Fi, rated at 300Mbps/sec in each band; twin USB ports, each one capable of supporting either a printer or a

hard disk drive; VPN server capabilities; four Gigabit Ethernet ports; a power switch on the rear; and three, high-gain antennae sticking out the back.

When you connect to the DSL-N55U's web UI, it delivers class-leading usability. The first page helps you set up the ADSL connection. Once that's done, there's a wireless and security setup wizard to go through, and you finally land on the router's dashboard page. This displays a network map, showing an at-a-glance view of the health of your internet connection, and the status of the wireless network. Click an item on the map and further information appears in a panel to the side.

With the ability to change basic settings in these panels, you'll barely need to wander outside the UI's main page for most changes. When you do, the router provides help by way of some simple wizards.

We particularly like the AiDisk function, which allows you to share storage across the internet through Asus' own DDNS service. Including account setup, we were able to share our connected disk via FTP in less than a minute.

The only significant features missing from the DSL-N55U are wireless repeating functions, and advanced parental controls. You can block keywords and URLs and restrict usage based on the time of day, but there's no whitelist control, nor more powerful, category-based filtering.

However, we're willing to set aside these concerns in light of the Asus' excellent all-round performance. At close range, we measured an average file-transfer rate of 13.6MB/sec over 2.4GHz, and 16.5MB/sec over 5GHz. At long range, speed over 2.4GHz was an impressive 6.3MB/sec. And, again, the DSL-N55U impressed over 5GHz, gaining

a steady rate of 3.1MB/sec. For range, it's second only to the Netgear D6300, which is far more expensive, and in fact, overall, it works out as the third-fastest router in the Labs, ahead of all its 802.11n rivals by some distance.

The Asus doesn't only impress in the wireless department. It also excelled in our USB disk and ADSL throughput tests. In the former, it delivered an average transfer rate of 12.2MB/sec, and in the latter it topped the table.

In short, the Asus DSL-N55U couples table-topping performance in all departments and a great range of features with supreme ease of use, and does it all for a modest price. There's no other router in this Labs that carries off that combination with such competent, all-round aplomb.

### PERFORMANCE

#### WIRELESS

2.4GHz short range	13.6MB/sec
5GHz short range	16.5MB/sec
2.4GHz long range	6.3MB/sec
5GHz long range	3.1MB/sec

#### USB

Average transfer speed	12.2MB/sec
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### OVERALL

#### PERFORMANCE

#### FEATURES & DESIGN

#### VALUE FOR MONEY







# Netgear DGND4000

A huge range of features, good future-proofing and quick all-round performance make this router a solid investment



» **PRICE** £80 (£96 inc VAT)  
 » **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

**I**t takes a fair bit to make a router stand out, but the Netgear DGND4000 has managed it this month: it's one of only two routers on test to support both ADSL and cable connections. This means you can buy it, safe in the knowledge that if you want to switch from BT or Sky to Virgin – or vice versa – in the future, you won't have to dump your router.

This isn't the only area in which the Netgear excels, though. There's dual-band concurrent

2.4GHz and 5GHz wireless, which run at 300Mbps/sec and 450Mbps/sec respectively. There are four Gigabit Ethernet ports at the rear, a pair of USB 2 sockets for sharing storage or a printer, and the full range of buttons and switches for power, WPS and wireless functions.

We also like that the router can be quickly associated with an OpenDNS account for powerful category-based website blocking, via a free service Netgear calls Live Parental Controls. Setting it up is easy: download the management utility from the Netgear website, run through the wizard, and the router will be associated with an OpenDNS account, allowing you to block adult-related sites with varying degrees of strictness.

You can even use the online Live Parental Controls to set up blocks of time and link them with different filter levels, so that, say, late at night, your network isn't

restricted at all, and during the day, all adult sites are blocked.

The DGND4000's web UI isn't particularly attractive, but it's responsive and easy to understand. It provides access to the broadest array of features of any router in this Labs, along with its flagship D6300 model. There's support for wireless repeating, user-configurable QoS controls, guest networks, and app support for Android and iOS devices. You can use the mobile apps to manage the router's various functions, from altering the wireless channel to setting up parental controls and temporary guest access, and browse the folder structure of connected USB disks.

Performance isn't bad, either. At close range, we recorded average speeds of 17.8MB/sec over 5GHz and 13.8MB/sec over 2.4GHz, results that place the router firmly in the top half of the speed tables. The router's 5GHz long-range performance is

decent too, maintaining 2.2MB/sec in our demanding file-transfer tests. Long-range 2.4GHz performance is found wanting, with only the Sky Hub posting a slower speed. Still, USB transfer speeds were excellent, with an average rate of 14.1MB/sec over a wired connection, and we found no issues with the router's ADSL performance.

The Netgear DGND4000 has few weaknesses. Its all-round performance is good, even taking into account that long-range 2.4GHz weak spot, and in terms of features it can't be beaten. The only thing that prevents it from walking off with the overall award is that its main rival – the Asus DSL-N55U – has better long-range performance at a similar price.

## PERFORMANCE

### WIRELESS

2.4GHz short range	13.8MB/sec
5GHz short range	17.8MB/sec
2.4GHz long range	1.9MB/sec
5GHz long range	2.2MB/sec

### USB

Average transfer speed	14.1MB/sec
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## OVERALL

### PERFORMANCE

### FEATURES & DESIGN

### VALUE FOR MONEY







## Belkin AC 1200 DB

Despite the high price, Belkin's flagship router is a disappointing performer

» **PRICE** £150 (£180 inc VAT)  
» **SUPPLIER** [www.currys.co.uk](http://www.currys.co.uk)

**T**he AC 1200 DB is the flagship of Belkin's range. It boasts the latest 802.11ac technology and, surprisingly, features an ADSL modem instead of cable support.

You'll have to pay through the nose for it, however. This router is the most expensive on test, and if you include the cost of the accompanying Belkin 802.11ac adapter at around £70, the overall price rockets to £250.

Is it worth paying this much for any router? Certainly not this one. Standard, 802.11n performance was middling: at long range over 5GHz we recorded an average of 2.2MB/sec – less than half that of the best on test. At long range over 2.4GHz, that result remained well behind the leaders, with an average of 4.5MB/sec.

The short-range tests were more disappointing, registering speeds of 10.6MB/sec over 5GHz and 8.2MB/sec over 2.4GHz. Using Belkin's own 802.11ac USB adapter, we recorded short-range speeds of 18.9MB/sec, which is the slowest of the three 802.11ac routers on

test this month, and the other results are a long way behind its flagship rivals.

To make matters worse, we only managed to achieve these rather slow speeds after resetting the router to factory settings. Our attempts to change passwords and switch on the router's 20/40MHz mode to boost 2.4GHz speeds had the reverse effect, dropping the speeds even further.

The AC 1200 DB has two USB ports on the rear, so you can hook up a printer and a USB drive, but using the router as a NAS box isn't practical – with a hard drive connected, we recorded poor average transfer speeds of 2.9MB/sec. It was also the only router in our ADSL tests not to exceed 2MB/sec in the FTP file-download test, hitting only 1.1MB/sec.

With disappointing all-round performance and a mediocre feature set, the Belkin does little to justify its price. Its cheaper rivals are quicker, and offer improved parental controls and mobile apps, making this a router we'd avoid at all costs.

**OVERALL** ★★☆☆☆☆  
**PERFORMANCE** ★★☆☆☆☆  
**FEATURES & DESIGN** ★★☆☆☆☆  
**VALUE FOR MONEY** ★★☆☆☆☆

## Belkin Play N600

A high price, lack of features and poor all-round performance make this router one to avoid

**T**he Belkin Play N600 looks very similar to its flagship cousin, the AC 1200 DB, and is reasonably easy on the eye. With its rounded corners and slender, wedge-shaped profile, this ADSL router will fit unobtrusively into all but the most stylish of settings.

Look at the specifications, however, and you'll see it's missing several key features. For instance, the four network ports running along its spine all run at 10/100 speed rather than the Gigabit of most other routers here. It has only one USB port while the other Belkin has two, and it also lacks the cutting-edge 802.11ac technology of its sibling.

The latter shouldn't be a huge problem. As we've shown in this Labs, 802.11ac holds little appeal other than short-range speed, and even then it doesn't offer much of a boost. Alas, the N600 doesn't compensate with decent performance in other areas. At long range, although we were able to connect over both 5GHz and 2.4GHz, speeds were slow, at 1.4MB/sec and 3.8MB/sec respectively.

At close range, speeds were worse. As with the AC 1200 DB,

» **PRICE** £80 (£96 inc VAT)  
» **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

we had problems when switching to 40MHz mode, and when changing the security method and password, forcing us to reset to factory defaults to achieve even remotely respectable speeds. Even then, the final results were poor, with average file-transfer speeds hitting only 6.5MB/sec over 5GHz and 5.8MB/sec over 2.4GHz.

With our USB test disk attached to the Play N600's single USB socket, we saw an average transfer rate of only 2.3MB/sec. That's atrocious, ruling out the Play N600 as a practical network file-sharing tool.

In fact, there's little else to compensate for the N600's general lack of get-up-and-go. There are no advanced parental controls, nor Android or iOS apps to help you manage the router. Combined with a price that's rather too high, we recommend you steer clear.

**OVERALL** ★★☆☆☆☆  
**PERFORMANCE** ★★☆☆☆☆  
**FEATURES & DESIGN** ★★☆☆☆☆  
**VALUE FOR MONEY** ★★☆☆☆☆







## BT Home Hub 3

Not bad for free, but it lacks 5GHz support, the USB port isn't very fast and the feature set is basic

» **PRICE** Free with BT Broadband package  
» **SUPPLIER** [www.bt.com](http://www.bt.com)

**B**T made a big fuss about the Home Hub 3 router when it first arrived in 2011. The central thrust of the advertising campaign focused on the unit's ability to dodge interference and maintain fast wireless speeds.

The Home Hub 3 does this by actively monitoring interference, not only from other wireless routers in the vicinity, but also from other wireless devices using the 2.4GHz spectrum – devices such as baby monitors, video senders and cordless phones. When it detects a strong source of interference, it automatically switches channels.

This is no longer the unique feature it once was – Sky's router does the same thing – but it works. We turned on a cheap video sender in the same channel as the BT router, and, using our spectrum analyser, saw the router switch to a less cluttered channel 30 seconds later.

This should ensure stable wireless connectivity in all but the most extreme circumstances, and in many cases this is all most people will need. However, the BT Home Hub 3 won't give you the fastest performance possible. At

2.4GHz long range, we measured a speed of 4.1MB/sec, and at close range speeds hit 5MB/sec – both acceptable, but only a third of the speed of the 5GHz-capable routers here, and half that of the best 2.4GHz router.

The Home Hub 3 has a USB port for sharing storage, but performance isn't particularly strong, hitting an average of only 3.6MB/sec; it doesn't support NTFS-formatted drives.

The rest of the feature list is underwhelming. Its parental controls are rudimentary: you can block particular devices at specific times, but there's no option to blacklist or whitelist websites (although BT provides McAfee software to do this at the PC level). There are no wireless repeating functions, no user-configurable QoS settings, and no iOS or Android apps to help manage router settings or add features.

The BT Home Hub isn't awful, and it's better than the one Sky provides, but its mediocre speed and limited feature set means that we suggest you opt for something better – the award-winning Asus or Netgear routers would do the job nicely.

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★

## Cisco Linksys EA2700

A prime candidate to replace a Virgin Media router, but flaky 5GHz performance stops us recommending it

**I**f you're looking for better performance than your Virgin Media-supplied cable router, your first port of call may be a budget, dual-band product such as the Cisco EA2700. For only £84, it offers concurrent dual-band wireless, and both bands can operate at up to 300Mbps/sec.

Cisco's new app-centric approach to its routers is evident. Instead of the text-heavy Linksys web UI, the EA2700 displays a user-friendly dashboard when you first log on, allowing you to view the router's status via a selection of large modules in the centre of the screen. The settings are accessed via a short series of links on the left-hand side, and the front-end can be customised by replacing modules, or dragging them to new positions.

It looks nice, but the features accessed via these modules are a mixed bunch. The parental controls allow you to block devices at particular times and blacklist sites, but there's no category-based filtering. The QoS tool is better, allowing prioritisation of services and network-connected devices via a simple drag-and-drop interface. The guest access module merely allows you to change the username and password, offering no control over what guests can access.

Cisco Linksys' Smart Wi-Fi (formerly Connect Cloud) technology is more useful. Like D-Link's mydlink service, the EA2700 can be linked to an online

» **PRICE** £70 (£84 inc VAT)  
» **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

account that allows you to manage the router remotely, without requiring a static IP address from your ISP or having to set up DDNS. It also allows you to manage the router via iOS and Android apps, and add advanced features, such as category-based website filtering, via the 69p Block the Bad Stuff app.

Alas, all the good work is undone in the performance tests. Over 2.4GHz, the EA2700 achieved 14MB/sec at close range and 5.5MB/sec over distance. Problems started to occur, however, when we attempted to test over 5GHz. At close range, the router froze every time we attempted to transfer files from and to our test laptop. At long range, the signal wasn't strong enough to even attempt the same test. Disappointingly, there's also no USB socket for sharing storage.

The EA2700 makes a good first impression with its innovative and easy-to-use UI and app management; the price is right, and 2.4GHz performance is excellent. However, its flakiness over 5GHz means we can't recommend it.

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★







## D-Link DIR-845L

Unusually shaped, with plenty of handy features, but performance is mediocre

» **PRICE** £76 (£92 inc VAT)  
» **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

**O**f all the routers in this Labs, the D-Link DIR-845L has the most startling appearance. Its cylindrical design, with all the ports running up the spine at the rear, makes this one of the neatest, most living-room-friendly routers around.

Alas, the innovation ends there. It's a cable-only router with no ADSL support, and its top theoretical speed is 300Mbps/sec; to eke out the most speed from a 5GHz 802.11n connection you need to be looking for a top speed of 450Mbps/sec.

Despite what the marketing material says about the DIR-845L's SmartBeam technology, which allegedly focuses the signal in the direction of devices, our tests recorded middling performance. At close range, average file-transfer speed topped out at 14.6MB/sec over 5GHz, falling to 8.1MB/sec over 2.4GHz. In our long-range test, it scored a relatively better 4.9MB/sec over 2.4GHz, but failed to maintain a reliable enough connection over 5GHz to run our tests.

The DIR-845L doesn't lack any major features. It has four Gigabit

Ethernet ports, a USB socket for sharing storage and, although we aren't huge fans of the text-heavy design, the router's web-based UI offers plenty of power tools.

You can set up and manage an OpenDNS-based website category filtering system, directly from the parental controls section. It also offers the option to track and view a history of the websites visited by each connected device.

There's wireless repeater support, guest network facilities, and the ability to manage the router remotely via the mydlink service. The latter, via an app or the website, allows you to control basic settings, such as switching the 2.4GHz and 5GHz networks on and off, viewing the IP address, and live traffic throughput. It can also send email alerts when new devices connect to the network, fail to connect, or new firmware is available, and you can take action to block specific devices.

The D-Link DIR-845L offers a handsome set of features at a tempting price for cable users, but middle-of-the-road performance sees it stumble in the category that matters the most.

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★

## DrayTek Vigor 2710n

Plenty of features, but the hardware is too basic and the price too high

**U**K-based DrayTek has been among the award-winners in past routers Labs, but falls well behind the leading pack in this group.

That's mainly due to its inability to keep up with the Joneses when it comes to wireless technology. The Vigor 2710n is the only non-ISP-supplied router in this Labs not to feature support for concurrent dual-band wireless networks. In fact, the Vigor 2710n is 2.4GHz only, with no support for 5GHz whatsoever.

That may have been excusable a few years ago, but with the 2.4GHz band becoming increasingly saturated in urban areas, it puts a big dent in this router's appeal. There are also no Gigabit Ethernet ports on this ADSL model, and only one USB port, which we had trouble getting to work with our test USB sticks and hard disk.

One feature the DrayTek offers that's provided by only a few similarly priced routers is VPN dial-out support, adding appeal for small businesses that want to give teleworkers secure, client-independent access to the office network. If you're prepared to learn your way around the Vigor's rather complicated

» **PRICE** £101 (£121 inc VAT)  
» **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

interface, it rewards with some other worthy features, too.

There's proper category-based website filtering, although this incurs a £48 annual charge after the initial 30-day trial period. It's also possible to set up a whitelist of permitted websites, which is far more useful for paranoid parents than a blacklisting facility. There's the facility to set up multiple SSIDs. There are wireless repeater functions, and tools for managing and measuring bandwidth.

Over 2.4GHz wireless, performance is perfectly sound. We measured a respectable 4.7MB/sec in the long-range test and 9.4MB/sec at close range.

There's no doubt that the Vigor 2710n has many features, and over 2.4GHz its speed is acceptable. However, for most domestic purposes, it's too complicated, and the price – given there's no 5GHz – fails to compensate.

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★







## Edimax BR-6478AC

The best-value 802.11ac router on test – and nippy, too – but it's basic in terms of features

» **PRICE** £125 (£150 inc VAT)  
» **SUPPLIER** [www.ebuyer.com](http://www.ebuyer.com)

**F**or anyone looking to make an early break into the world of 802.11ac routers, the Edimax BR-6478AC looks like a tempting buy. For £150, you get not only a dual-band 802.11ac router, but also the USB dongle that accompanies it. To buy the equivalent Netgear bundle – a D6300 with an A6200 – you're looking at £220 at least.

The price isn't the only advantage the BR-6478AC bundle holds over its rival. The AC1200 adapter included is a USB 3 device, theoretically eliminating the USB 2 speed bottleneck that hobbles Netgear's A6200 adapter.

In practice, the router and adapter combination isn't as strong as that of the Netgear. At close quarters, over 5GHz, we measured an average file-transfer rate of 18.7MB/sec with our embedded 802.11n adapter, rising to only 21.6MB/sec using the bundled 802.11ac adapter. The Netgear achieved 26.6MB/sec and 25.1MB/sec respectively. In



the long-range test over 5GHz, we failed to get a good enough signal to carry out the test with either the embedded 802.11n adapter or the bundled 802.11ac adapter.

In the 2.4GHz band, the results were more impressive, with speeds of 18.1MB/sec close up and 5.9MB/sec at long range, both beating the Netgear D6300.

However, the Netgear wins with its overall balance of performance, and its far more impressive features. The Edimax is only a cable router, while the Netgear boasts both ADSL and cable capabilities. The Edimax has no USB port, while the Netgear has two, and the fastest USB storage performance in the Labs to boot. And, although we like the simple layout of the Edimax's web UI, there's no advanced parental controls or accompanying apps.

If you really want 802.11ac performance, but can't face spending £200 plus, the Edimax BR-6478AC is the way to go. It's a great-value bundle, and the router itself has speed to burn. However, you're sacrificing many useful features, which you can retain by spending £12 more on the more rounded, equally fast Netgear D6300, or by dropping to the slightly slower, but far cheaper Netgear DGND4000.

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★

## Netgear D6300

A seriously fast router and packed with features, but tarnished by bugs

**N**etgear's R6300 was the first 802.11ac router (web ID: 377218) we tested, and we were impressed with its performance. The D6300 adds ADSL to the mix, and we've now tested the router with its own-brand 802.11ac USB adapter. When we first tested the R6300, we had to use a pair of the routers in bridge mode.

The D6300's maximum nominal throughput over its 802.11ac 5GHz link is 1,300Mbps/sec, dropping to 300Mbps/sec over 2.4GHz. Yet, with the £60 Netgear A6200 USB adapter plugged into a free port on our test laptop, we saw an average speed at close range of 25.1MB/sec. That's good, but not as fast as we had expected.

In fact, with the 802.11ac USB adapter it was a touch slower than the results we saw with our laptop's integrated 802.11n Intel WiFi Link 5300 adapter, which peaked at 35MB/sec and averaged at an impressive 26.6MB/sec.

If we examine the results more closely, we can see where the problem lies. The speed actually peaks at 31.2MB/sec, which is around the same speed at which we'd expect a USB 2 external disk drive to run. It's no coincidence that the Netgear

» **PRICE** £135 (£162 inc VAT)  
» **SUPPLIER** [www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)

A6200 USB adapter is a USB 2 device, too.

If you already have a fast 3x3 Intel adapter, then, there isn't any advantage to buying the D6300 for its 802.11ac capabilities. If you don't, £220 is an awful lot of cash to fork out when the equivalent Edimax bundle costs only £150.

The D6300 shouldn't be discounted, though. Over 5GHz, it produced the fastest speeds in our long-range test of any router in the Labs, and it was nippy over 2.4GHz at long range as well. At close range over 2.4GHz, however, it refused to channel bond, resulting in an average speed of only 9MB/sec.

Even without channel-bonded results, the D6300 is the fastest all-round router if you include its 17.8MB/sec NAS drive test. It's also packed with more useful features than most. However, its failure to deliver 2.4GHz channel bonding deprives it of an award.

**OVERALL** ★★★★★  
**PERFORMANCE** ★★★★★  
**FEATURES & DESIGN** ★★★★★  
**VALUE FOR MONEY** ★★★★★





# How to switch from your ISP's router



## Sky

Sky has a more draconian policy when it comes to third-party routers: it doesn't officially support them. There's technically nothing to prevent you from buying your own router and plugging it in, but you need certain login settings to connect your new ADSL router to the internet, and Sky's technical support team refuses to hand these over. Moreover, you can't discover those settings by simply digging around in the Sky Hub's web UI.

There are ways around this blockade. You can use your new router as an access point on your home network by connecting it to the Sky router via Ethernet cable and changing various IP and DHCP settings. This can become fiddly, though, and complicates the management of DDNS, port forwarding and the like.

The other way is to extract the information you need from the Sky router, using a hack. This involves the use of the packet-sniffing application, Wireshark, to monitor the connection. Once this is up and running, you should be able to run a search for the string "@skydsl" using the "Packet bytes" option in the Find Packet dialog box. If you get a match, the username will take the form: <your router's mac address with no colons>@skydsl, followed by a vertical separator character, then the password, which should be six to eight characters long.

Sky broadband uses a different form of authentication (MER) to

most UK broadband suppliers. If your router doesn't autodetect the connection, you need to manually enter the ADSL settings.

For the Labs-winning Asus DSL-N55U, this data is held in a preset; choose the Sky option from the list of ADSL providers in the initial internet setup wizard, and enter your username and password. For the Netgear DGND4000, choose to set up the internet connection manually, then in the Advanced | Setup | ADSL settings section of the router's web UI, set the VCI and VPI values to 0 and 40 respectively, and the multiplexing method to VC.

Be warned: Sky will most likely refuse to support customers who install their own hardware if a fault develops on the ADSL line.



## BT

BT's Home Hub 3 is the most straightforward of the three to replace. If you use BT Infinity, disconnect the Home Hub 3 from your Infinity modem and replace it with any cable router – the Netgear DGND4000 will do fine – via its Ethernet WAN port. The router should pick up an IP address from the modem's DHCP server.

If you're on a BT ADSL connection, it should simply be a matter of phoning BT's technical support and asking for the ADSL username and password. Most ADSL routers sold in the UK will work out of the box with a BT connection via their internet setup wizard routines, and shouldn't require any extra configuration.

If you're intending to switch routers from the one your ISP supplied, it would seem to be a straightforward task. Don't assume it's simply a matter of swapping one box for another, however. There are various hurdles and requirements that you should be aware of before you start. Here's how to make the change with three of the UK's most popular ISPs.



## Virgin Media

When Virgin announced last year that it was going to upgrade the speed of all its customer connections, it forced users to adopt the new Virgin Media Hub, which combined modem and wireless router in one box. A neat idea, you might have thought, but it makes it trickier to swap routers.

Previously, customers had two boxes – a modem to connect to

Virgin Media, and a supplied router for wireless and wired networking. To upgrade, all you needed to do was disconnect the Virgin router from your modem, plug in the new one, and wait for it to be allocated an IP address.

This arrangement can also be achieved with the Virgin Media Hub, but you need to perform some preparatory work first. First log on to the router's web UI (the default IP address is 192.168.0.1), then click the Hub Settings button and then the Enable Modem Mode button further down the page. This turns off all the Hub's wireless and router functions, transforming it into a standalone cable modem.

To connect your new router to the Hub, simply use an Ethernet cable to connect its WAN/internet port to the Ethernet port on the Hub closest to the threaded cable connector (all the other sockets are disabled when you switch to modem mode), wait for it to pick up an IP address and you should be able to use the new router to access the internet.





## Sky Hub

Poor wireless performance and a limited feature set, at a high price for existing customers

» **PRICE** New customers, free; upgrade, £57 (£69 inc VAT)  
» **SUPPLIER** [www.sky.com](http://www.sky.com)

If there's one thing that ties ISP-supplied routers together, it's a lack of high-end features, and the Sky Hub (model SR101) is no exception. It's a single-band router operating an 802.11n network at 144Mbps/sec speeds; all its network ports are the slower 10/100 type; and there's no sign of anything as useful as a USB port for sharing a hard disk drive.

It does have a few useful tricks up its sleeve, however. First, it's very efficient. It consumes only 3W when idle, which could save you around £13 per year (at standard rates) in electricity costs over this month's Labs winner. Second, it has no power brick, which cuts down on cable clutter. Third, and its biggest selling point, is its ability to detect interference from non-Wi-Fi sources and actively hop channels.

It's similar to the BT Home Hub 3 in that respect, and it works just as well. While monitoring the RF spectrum with a Wi-Spy DBx and MetaGeek's Chanalyzer software, we introduced a video sender signal in the same channel in which the Sky Hub was

operating. Around 20 seconds after switching on the video sender, we saw the Sky Hub jump from channel 11 to channel 6. This should insure against the most perplexing Wi-Fi problems, cutting down on the amount of time spent on tech support lines.

Alas, general wireless performance is so poor that we'd advise most users to upgrade to a third-party router. At close range, its 2.4GHz speed was acceptable, hitting 7.7MB/sec, but long-range performance was pitiful. From a distance of 40m, we recorded an average transfer rate of 0.3MB/sec. No other router on test dipped much below the 2MB/sec mark in this test, making the Sky Hub's result even more insipid.

We think asking existing Sky customers to pay £69 for a router this limited is outrageous. Unfortunately, as Sky hides the username and password, the only way to use a third-party router on Sky connections is to extract the information from the router yourself (*see p150*). We hope Sky either changes its hardware or its policy on third-party devices soon.

**OVERALL** ★★☆☆☆☆  
**PERFORMANCE** ★★☆☆☆☆  
**FEATURES & DESIGN** ★★☆☆☆☆  
**VALUE FOR MONEY** ★★☆☆☆☆

## Virgin Media Hub

A basic router, despite 5GHz support, but wireless performance isn't terrible

With ISP-provided routers, our advice has so far been "replace it as soon as you can". With the Netgear-manufactured Virgin Media Hub, however, you might want to think again. It's a competent piece of kit.

As with the BT Home Hub 3 and the Sky Hub, features are thin on the ground. The router is nominally dual band, but those networks can't be run concurrently, so unless you're willing to cut off your 2.4GHz devices from the internet completely, the 5GHz mode is redundant. Elsewhere, there's no sign of advanced, router-based parental controls, no USB ports for sharing storage, no mobile app management of settings, and no configurable QoS settings.

However, it allows for more flexibility than either of its ISP-supplied rivals. It has four Gigabit Ethernet ports where the others have only 10/100 Ethernet. It also boasts guest-network capabilities, so you don't have to give full access on the home network to visitors who need internet connectivity.

In terms of performance, it puts its freebie rivals to shame. At close

» **PRICE** Free with all Virgin Media contracts  
» **SUPPLIER** [www.virginmedia.com](http://www.virginmedia.com)

range, we recorded an average of 13.4MB/sec over 2.4GHz, which places the Virgin Media Hub firmly in the top half of the speed table. It's less impressive at long range, with an average transfer rate of 2.7MB/sec placing it third from the bottom, but it's faster than the Netgear DGND4000 and Sky Hub.

If you find you need a greater range or more features, the Virgin Media Hub can be converted into a standalone modem by clicking a button in the web-based user interface. This allows you to hook up any cable router.

The only thing that really irritates us is the bright-blue, backlit Virgin Media logo on the front, which can't be disabled. That aside, we're quietly impressed with the Media Hub: it's quick, has a reasonable set of features, and doesn't try to lock you in.

**OVERALL** ★★★★★★  
**PERFORMANCE** ★★★★★★  
**FEATURES & DESIGN** ★★★★★★  
**VALUE FOR MONEY** ★★★★★★





## VIEW FROM THE LABS

**T**here were some things in this Labs that didn't surprise us: the fact that the ISP-supplied routers were more sparsely featured than their third-party counterparts; the fact that, without exception, they were all slower and less flexible; and the fact that every one of them struggled to compete with the best in the Labs when it comes to wireless coverage.

If you want to make the most of your home network – to manage it remotely, restrict internet access to children with any degree of control, stream video reliably, or use your router as a basic NAS drive – you have to spend a little more cash. If you want good speed close up and at long range, buy one of our award-winners rather than sticking with what you have. Either the Asus DSL-N55U or the Netgear DGND4000 will do the job admirably.

However, there was one big surprise this month. Our findings on the new 802.11ac routers revealed that, as yet, there's very little reason to go all out for the new standard. The reason isn't that the standard itself is immature, nor that the routers themselves aren't fast enough: it's simply that the rest of the technology

industry has yet to catch up. In order to obtain the speeds promised by 802.11ac, absolutely every part of the chain, from source to destination, has to support the new protocol – or be capable of speeds equal to that of the router or faster.

That means the adapter embedded in your laptop, phone or tablet; the Ethernet connection used by your wired components; the Ethernet connections on the router itself (10/100 Ethernet simply won't suffice); and

**“Our tests revealed very little advantage to having 802.11ac”**

the interface between the wireless adapter and your device's central storage.

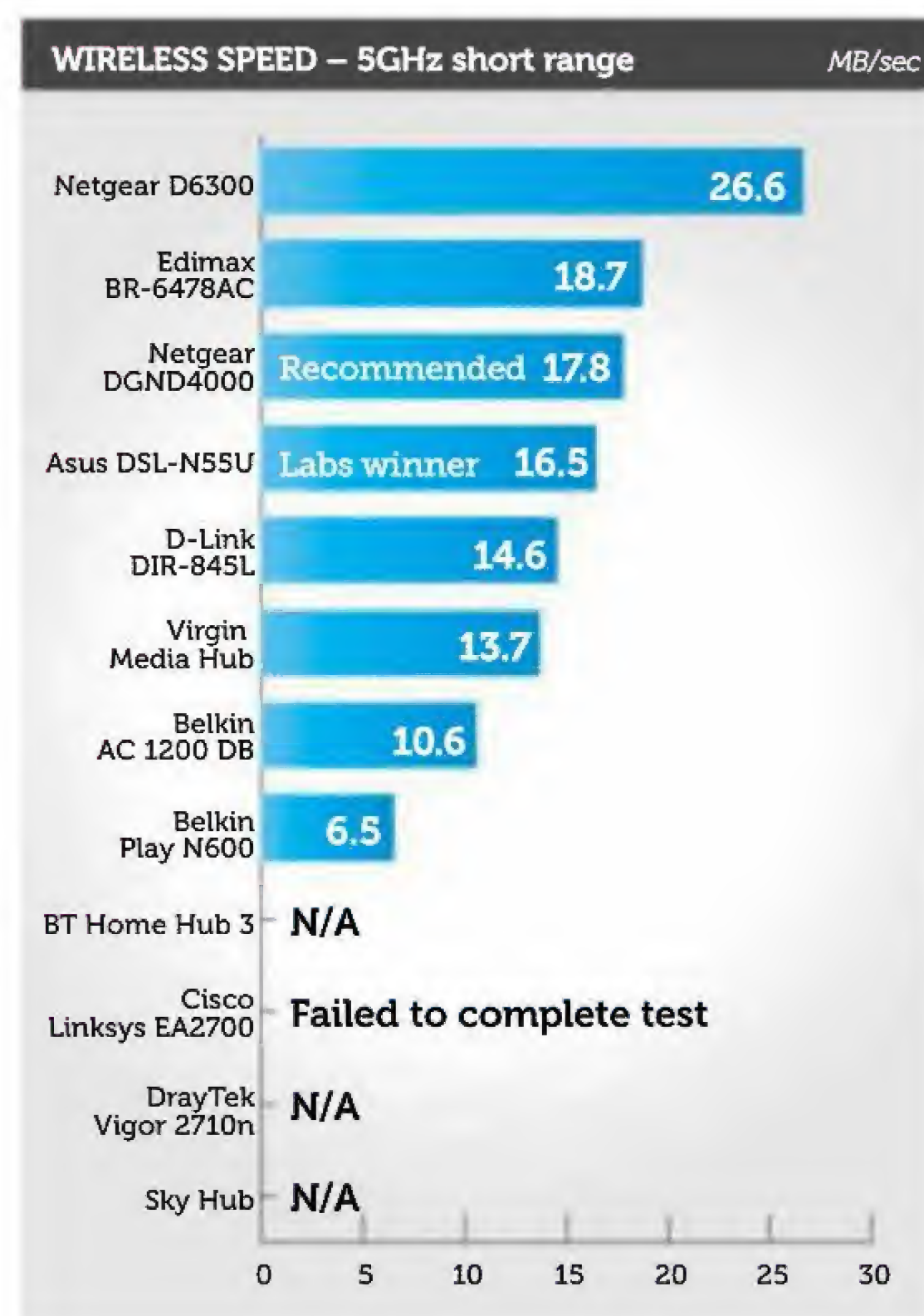
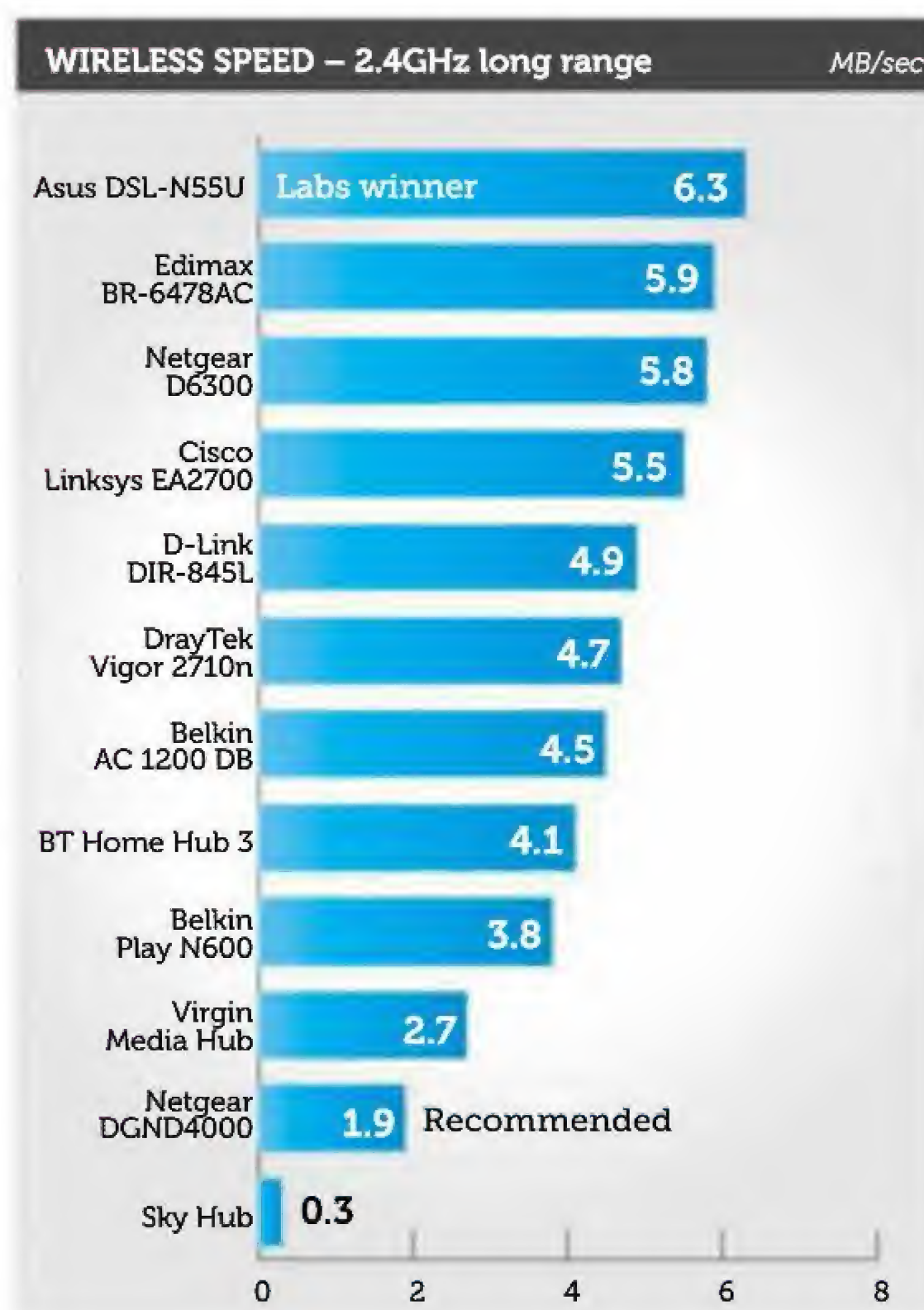
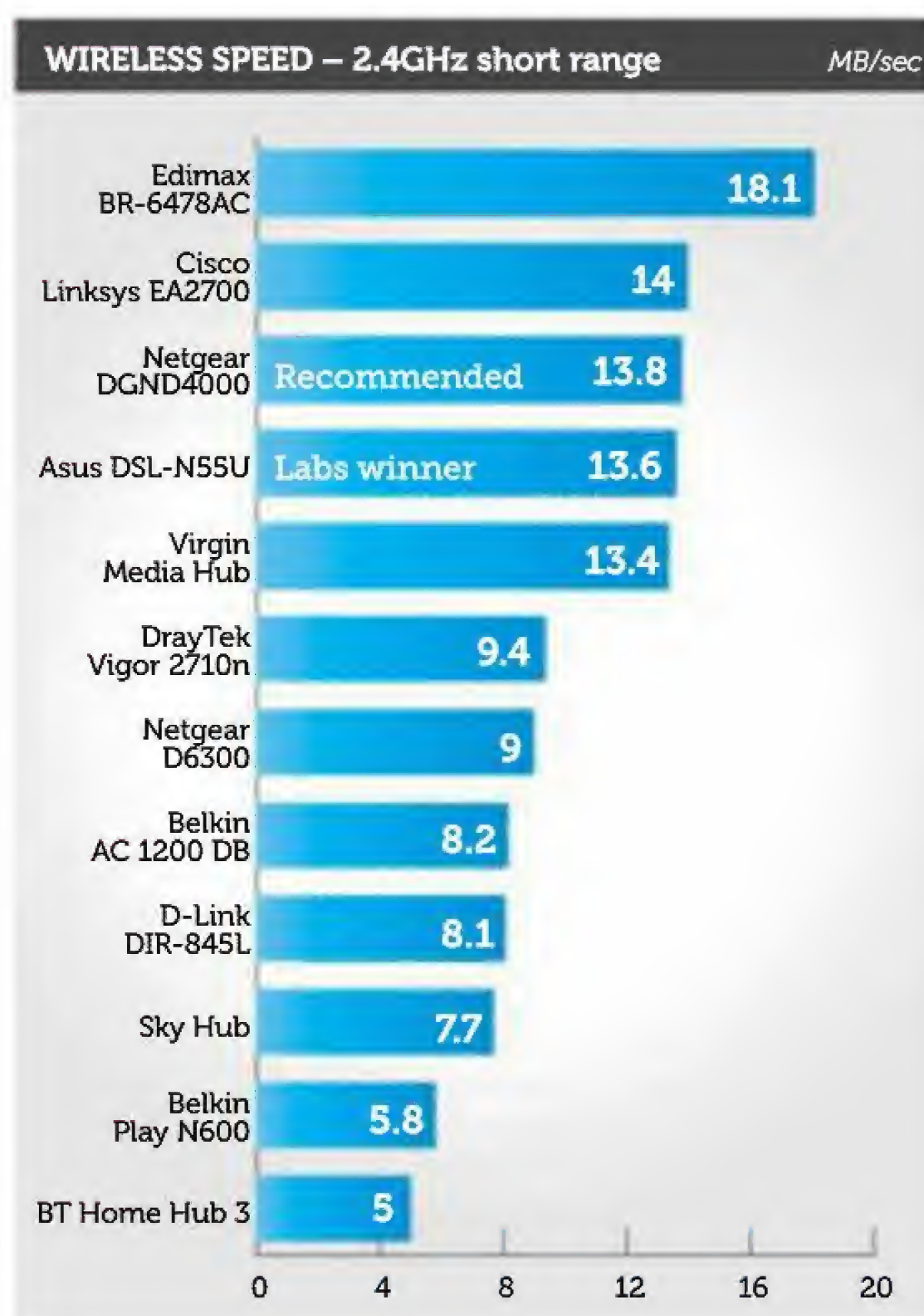
As it stands, we're a long way from being at this stage. Very few client devices make full use of the 802.11n standard these days, let alone 802.11ac. Most dual-band adapters embedded in laptops and other devices support a maximum of 2x2 MIMO streams, for instance; only a 3x3 configuration ensures the fastest speeds possible under 802.11n.

Indeed, even while manufacturers produce 802.11ac routers capable of theoretical speeds three times as fast as 802.11n, they too are guilty of undermining the onward march of progress. Most of the 802.11ac adapters we tested are rated at 867Mbps/sec, yet their physical interface – USB 2 – is capped at 480Mbps/sec. None of them provided enough oomph to complete our long-range test. Only Edimax produces a USB 3 802.11ac adapter, and even then, with every bottleneck seemingly eliminated, our tests revealed little real-world advantage to having 802.11ac.

Perhaps it's only a matter of time before every smartphone, tablet and laptop has an 802.11ac adapter in it, at which point (at close range at least) we should all be able to enjoy USB-like network streaming and file transfer. Until that begins to happen, however, 802.11n will continue to dominate the market, and it's the technology we'll continue to recommend.



**JONATHAN BRAY**  
jonb@pcpro.co.uk





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# THE A-LIST

## LAPTOPS, PCs & TABLETS

### COMPACT TABLET

#### Asus Fonepad

£150 (€180)

[www.amazon.co.uk](http://www.amazon.co.uk)

WEB ID 381196 ISSUE 225



NEW  
ENTRY

The Asus Fonepad is a 7in tablet with 3G, and it's also a smartphone; a giant-sized handset, complete with an integrated earpiece and microphone. It's a bit bonkers, but it's superb value.

**KEY SPECS** 7in 800 x 1,280 IPS LCD; Android 4.1.2; dual-core 1.2GHz Intel Atom Z2420 CPU; 1GB RAM; 16GB storage; microSD slot; single-band 802.11n Wi-Fi; 1.2MP front camera; 120 x 11 x 196mm; 316g

#### ALTERNATIVE

#### Apple iPad mini

The iPad mini is light, beautifully designed and blessed with excellent battery life. The price is high, but this compact tablet exudes a luxurious charm that few of its rivals can match.

16GB, £269 (3G, £369); 32GB, £349 (3G, £449) [www.apple.com/uk](http://www.apple.com/uk) WEB ID 378061

### FULL-SIZE TABLET

#### Apple iPad (4th gen)

32GB, £479 (3G, £579)

[www.apple.com/uk](http://www.apple.com/uk)

WEB ID 378337 ISSUE 220



The Retina display is as stunning as ever, but Apple pushes the iPad to new heights of excellence thanks to an upgraded ARM processor. We'd still opt for the 32GB version, though.

**KEY SPECS** 9.7in 1,536 x 2,048 IPS LCD; iOS 6; 1.2GHz dual-core Apple A6X; 1GB RAM; 32GB storage; dual-band 802.11n Wi-Fi; Bluetooth 4; 5MP rear/1.2MP front camera; 186 x 241 x 9.7mm; 662g

#### ALTERNATIVE

#### Nexus 10

The Nexus 10 harnesses Samsung's tablet expertise to create the finest Android slate money can buy. A stunning 2,560 x 1,600 display is matched by nippy performance – and it's affordable, too.

16GB Wi-Fi, £266 (€319); <http://play.google.com> WEB ID 378280

### BUDGET LAPTOP

#### Lenovo IdeaPad Z580

£375 (€450)

[www.saveonlaptops.co.uk](http://www.saveonlaptops.co.uk)

WEB ID 379570 ISSUE 219



An attractive exterior, solid ergonomics and a spritely Core i5 processor combine to create a cracking budget laptop.

**KEY SPECS** 2.5GHz Intel Core i5-3210M; 8GB DDR3 RAM; 750GB hard disk; DVD-RW; Intel HD Graphics 4000; 15.6in 1,366 x 768 TFT; Windows 8; 376 x 250 x 33mm; 2.41kg

#### ALTERNATIVE

#### Asus VivoBook S200E

Asus delivers a delectable 11.6in touchscreen Windows 8 laptop for an unbelievably low price. Only the dim screen dampens our enthusiasm.

£333 (€400); [www.pcworld.co.uk](http://www.pcworld.co.uk) WEB ID 378034

### HIGH-END LAPTOP

#### Asus N56VM

£617 (€740)

[www.saveonlaptops.co.uk](http://www.saveonlaptops.co.uk)

WEB ID 376558 ISSUE 216



Asus' N56VM packs in a 15.6in Full HD display, a quad-core Ivy Bridge CPU and competent gaming graphics from Nvidia. With great build quality and crisp audio, it's a superb all-rounder.

**KEY SPECS** 2.3GHz Intel Core i7-3610QM; 8GB RAM; 750GB HDD; Blu-ray reader; Nvidia GeForce GT 630M; 15.6in 1,920 x 1,080 TFT; Windows 7 Home Premium; 380 x 255 x 28mm; 2.75kg. Part code: N56VM-S4034V

#### ALTERNATIVE

#### Asus VivoBook S400E

The Asus' 14in touchscreen could be brighter, but great performance and sturdy build quality partner with a stylish Ultrabook-like chassis.

£583 (€700); [www.pcworld.co.uk](http://www.pcworld.co.uk) WEB ID 379618

### ULTRABOOK

#### Dell XPS 13

£899 (€1,079)

[www.dell.co.uk](http://www.dell.co.uk)

WEB ID N/A ISSUE 224



Dell's XPS 13 is the best-value Ultrabook out there. The Ivy Bridge CPU and nippy SSD make for scorchingly quick performance, and the Full HD panel is as good as it gets.

**KEY SPECS** 2GHz Intel Core i7-3537U; 8GB RAM; 256GB SSD; Intel HD Graphics 4000; 13.3in 1,920 x 1,080 TFT; Windows 8 64-bit; 316 x 205 x 21mm; 1.36kg

#### ALTERNATIVE

#### Samsung Series 9 900X3D

Boasting build quality that outstrips a MacBook Air, and a price that's significantly lower, the latest update to Samsung's 14in Ultrabook is a seriously tempting bargain.

£695 (€834); [www.saveonlaptops.co.uk](http://www.saveonlaptops.co.uk) WEB ID N/A

NEW

### ENTHUSIAST LAPTOP

#### Apple MacBook Pro with Retina display

£1,499 (€1,799)

[www.apple.com/uk](http://www.apple.com/uk)

WEB ID 375337 ISSUE 215



It's ditched the DVD drive and slimmed down, but the headline is the incredible 2,880 x 1,800 screen, which is forcing developers to update software. A glimpse at the future of laptop displays.

**KEY SPECS** 2.4GHz Intel Core i7-3630QM; 8GB RAM; 256GB SSD; Intel HD Graphics 4000; Nvidia GeForce GT 650M; 15.4in 2,880 x 1,800 TFT; OS X; 1yr C&R warranty; 359 x 247 x 18mm; 2.02kg

#### ALTERNATIVE

#### Alienware M17x R4

A quad-core Ivy Bridge CPU and AMD's top-end Radeon HD 7970M graphics combine to make the M17x R4 a gaming force to be reckoned with.

£1,499 (€1,799); [www.dell.co.uk](http://www.dell.co.uk) WEB ID 374749



# Our hand-picked selection of 102 best buys, chosen from the dozens of products tested each month in the PC Pro labs

## MEDIA PC

### Chillblast Fusion Vacuum Mini

£832 (£999)  
www.chillblast.com  
WEB ID 376774 ISSUE 218



A silent and well-specified living room PC that delivers dual TV tuners and promising performance – but it doesn't come cheap.

**KEY SPECS** 2.8GHz Intel Core i7-3770S; 16GB RAM; 250GB Samsung 840 SSD; Blu-ray reader; 2 x USB 3; 6 x USB 2; Windows 7 Home Premium; 2yr C&R warranty; 240 x 250 x 100mm

## ALTERNATIVE

### Apple Mac mini

Apple's hardware is as enticing as ever, and forgoing some of the Mac mini's expensive upgrades makes this system good value, too.

£799 (£959); www.apple.com/uk WEB ID 379153

## BUDGET PC

### Chillblast Fusion Templar

£582 (£699)  
www.chillblast.com  
WEB ID 380104 ISSUE 223



Good performance goes hand in hand with an excellent Iiyama monitor, and there's plenty of upgrade potential as well. At this price, the Fusion Templar is a superb choice for buyers on a budget.

**KEY SPECS** 3.3GHz Intel Core i5-3570K @ 4.5GHz; 8GB RAM; 1TB hard disk; DVD writer; AMD Radeon HD 7770 graphics; 23in 1,920 x 1,080 TFT; Windows 8 64-bit; 1yr RTB warranty

## ALTERNATIVE

### Palicomp Phoenix i5 Destiny

A Blu-ray drive, a solid 22in Full HD monitor, and now with an updated graphics card and new Ivy Bridge, overclocked processor. At this price, it's a great low-end deal.

£582 (£699); www.palicomp.co.uk WEB ID 366679

## BUSINESS/EXECUTIVE LAPTOP

### Lenovo ThinkPad X1 Carbon

£1,235 (£1,482)  
www.lenovo.co.uk  
WEB ID 377827 ISSUE 220



Lenovo revisits its X1 and produces the business-class Ultrabook we've been waiting for. We're not as keen on the touchscreen version (web ID: 381046).

**KEY SPECS** 1.8GHz Intel Core i5-3427U; 8GB RAM; 240GB SSD; 14in 1,600 x 900 TFT; dual-band 802.11n Wi-Fi; Bluetooth 4; 3G; 3yr RTB warranty; 331 x 226 x 19mm; 1.36kg

## ALTERNATIVE

### Dell Latitude 10

The first Windows 8 business tablet excels with class-leading battery life, solid peripherals and practical hardware. For sheer flexibility, nothing comes close.

£550 (£661); www.dell.co.uk WEB ID 380869

## ALL-IN-ONE PC

### Apple iMac 27in

£1,816 (£2,179)  
www.apple.com/uk  
WEB ID 379831 ISSUE 223



Apple's redesigned iMac is a force to be reckoned with. Superb design is married with great all-round performance, and the high-resolution 27in display is by far the best we've seen on any all-in-one.

**KEY SPECS** 3.4GHz Intel Core i7-3770; 8GB RAM; 1TB Fusion Drive; Nvidia GeForce GTX 680MX; 27in 2,560 x 1,440 IPS TFT; OS X Mountain Lion; 1yr RTB warranty; 650 x 203 x 516mm

## ALTERNATIVE

### Asus ET2300

The versatile double-hinged design and good screen work well with Windows 8, and the price is right, too.

£707 (£849); www.very.co.uk WEB ID 380698

## HIGH-END PC

### CyberPower Infinity Fusion GT

£1,208 (£1,449)  
www.cyberpowersystem.co.uk  
WEB ID 380950 ISSUE 224



CyberPower lashes together a blisteringly fast SSD RAID array and an overclocked Core i5, and the result is a turbo-charged PC. The IPS monitor is superb, too.

**KEY SPECS** 3.4GHz Intel Core i5-3570K @ 4.6GHz; 8GB RAM; 2 x 128GB SSDs; 1TB HDD; AMD Radeon HD 7970 graphics; Windows 8 64-bit; 3yr RTB warranty; 210 x 485 x 475mm

## ALTERNATIVE

### Wired2Fire HAL 4000

The Fractal Design Node 304 case makes for a highly compact base unit, but thanks to judicious overclocking and a lightning-fast SSD RAID array, the HAL 4000 packs in serious performance.

£1,166 (£1,400); www.wired2fire.co.uk WEB ID 380227

## BUSINESS PC

### Lenovo ThinkStation E31

£745 (£894)  
www.lambda-tek.com  
WEB ID 376852 ISSUE N/A



This small-form-factor workstation is tiny, but it still includes an Intel Xeon processor and Nvidia Quadro graphics for a reasonable price.

**KEY SPECS** 3.3GHz Intel Xeon E3-1230 v2; 4GB RAM; 1TB HDD; DVD-RW; Nvidia Quadro 600 graphics; Windows 7 Professional; 3yr RTB warranty

## ALTERNATIVE

### Fujitsu Esprimo Q510

Fujitsu's compact PC base unit takes up barely any space on a desk, delivers plenty of power and has ample connectivity.

From £459 (£551); www.dabs.com WEB ID 378769

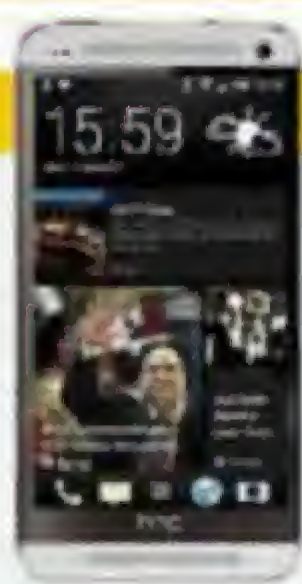


## MOBILE

### SMARTPHONE

#### HTC One

Free, £31/mth, 24mths  
[www.buymobilephones.net](http://www.buymobilephones.net)  
**WEB ID 380644 ISSUE 224**



HTC reclaims the top spot with the HTC One. A benchmark-busting handset that marries stunning design with all-round panache, this is the finest smartphone money can buy.

**KEY SPECS** 1.7GHz CPU; 2GB RAM; 32GB storage; 4.7in 1,080 x 1,920 TFT; 802.11ac Wi-Fi; 8MP camera; Android 4.1.2; 68 x 137 x 9.3mm; 143g

#### ALTERNATIVE

#### Samsung Galaxy S III

With a superb 4.8in screen and 8MP camera, a quad-core processor and a host of software extras, it's a good alternative.  
 Free, £26/mth, 24mths; [www.omio.com](http://www.omio.com) **WEB ID 374950**

### SATNAV

#### TomTom

From £23 (£28)  
 Apple App Store  
**WEB ID 375418 ISSUE 213**



The TomTom app for iPhone and iPad is undoubtedly the best of the bunch, but its Android brethren is inferior and works with only certain screen resolutions. Opt for CoPilot instead.

**KEY SPECS** Requires iPhone/iPad (or iPod Touch with GPS add-on); UK/ROI maps; HD Traffic, £27/yr or £4/mth; speed cameras, £27/yr or £4/mth

#### ALTERNATIVE

#### TomTom Go Live 825

Performs superbly and at a very reasonable price. If it's too much, the Go Live 820 is the same but with a 4in screen.  
 £140 (£168); [www.handtec.co.uk](http://www.handtec.co.uk) **WEB ID 368701**

### EBOOK READER

Amazon  
 Kindle Paperwhite  
 Wi-Fi, £91 (£109);  
 Wi-Fi and 3G, £141 (£169)  
[www.amazon.co.uk](http://www.amazon.co.uk)  
**WEB ID 377665 ISSUE 219**



Amazon adds a front light and a capacitive touchscreen to its already excellent Kindle, and the result is by far the best ebook reader money can buy.

**KEY SPECS** 6in 758 x 1,024 Pearl E Ink screen; 2GB storage; 1yr RTB warranty; 117 x 9 x 169mm; 213g

#### ALTERNATIVE

#### Kobo Glo

Kobo's answer to the Kindle Paperwhite partners front lighting with an optical touchscreen.  
 £81 (£98); [www.morecomputers.com](http://www.morecomputers.com) **WEB ID 377821**

## MONITORS

### BUDGET TFT

#### Dell UltraSharp U2312HM

£134 (£161)  
[www.amazon.co.uk](http://www.amazon.co.uk)  
**WEB ID 375760 ISSUE 214**



With falling prices placing it among the cheapest monitors on the market, Dell's UltraSharp U2312HM delivers an unusually refined, high-end performance for sensible money.

**KEY SPECS** 23in 1,920 x 1,080 IPS matte TFT; DVI; D-SUB; DisplayPort; 300cd/m² brightness; 547 x 186 x 493mm

#### ALTERNATIVE

#### Dell UltraSharp U2412M

Not the cheapest 24in monitor, but the increasingly rare 1,920 x 1,200 resolution IPS panel is superb.  
 £166 (£200); [www.amazon.co.uk](http://www.amazon.co.uk) **WEB ID 375823**

**NEW**

### PREMIUM TFT

#### ViewSonic VP2770-LED

£458 (£548)  
[www.morecomputers.com](http://www.morecomputers.com)  
**WEB ID 377770 ISSUE 220**



The ViewSonic's 27in, 2,560 x 1,440 IPS panel delivers ample brightness and fantastic colour accuracy straight out of the box, and the USB 3 hub is a boon. At this price, it's a bargain.

**KEY SPECS** 27in 2,560 x 1,440 IPS semi-glossy TFT; DisplayPort, HDMI, DVI-D, D-SUB; 2 x USB 3; 2 x USB 2; 642 x 348 x 514mm

#### ALTERNATIVE

#### Dell UltraSharp U2913WM

Great image quality and features are supported by a three-year warranty – this is ideal for games and movie buffs.  
 £383 (£460); [www.scan.co.uk](http://www.scan.co.uk) **WEB ID 380038**

### SPECIALIST TFT

#### Eizo ColorEdge CG276

£1,332 (£1,598)  
[www.nativedigital.com](http://www.nativedigital.com)  
**WEB ID N/A ISSUE 225**



The Eizo ColorEdge CG276 is one of the finest TFTs ever made. Image quality is superb, and the ingenious integrated colorimeter takes the hassle out of regular colour calibration.

**KEY SPECS** 27in 2,560 x 1,440 IPS TFT; 350cd/m²; 1,000:1 contrast; DisplayPort; HDMI; DVI; 646 x 282 x 577mm; 1

#### ALTERNATIVE

#### Eizo ColorEdge CX240

Hugely expensive for a 24in monitor, but image quality is amazing thanks to RGB LED backlighting.  
 £915 (£1,099); [www.parkcameras.com](http://www.parkcameras.com) **WEB ID 377272**

**NEW ENTRY**

## CAMERAS

### DIGITAL COMPACT/CSC

#### Sony Alpha NEX-6

£624 (£749)  
[www.procamerashop.co.uk](http://www.procamerashop.co.uk)  
**WEB ID 378553 ISSUE 221**



With a small, sharp kit lens, fast autofocus, intuitive controls and integrated flash, the NEX-6 is the first compromise-free CSC: a delight to use, and with first-class image quality.

**KEY SPECS** 16MP APS-C sensor; 16-50mm f/3.5-5.6 kit lens; 10fps burst mode; SDXC/MS Pro Duo slot; 1yr RTB warranty; 120 x 43 x 67mm; 470g

#### ALTERNATIVE

#### Canon PowerShot S110

With top-quality stills and video, and a comprehensive set of features, Canon's S110 is the ultimate pocket-sized compact.  
 £199 (£239); [www.digitalrev.com](http://www.digitalrev.com) **WEB ID 378604**

### DSLR

#### Nikon D600

£1,041 (£1,249)  
[www.procamerashop.co.uk](http://www.procamerashop.co.uk)  
**WEB ID 378103 ISSUE 220**



Nikon makes a full-frame DSLR affordable. With high-end features and sublime image quality, the D600 should be the choice of amateur enthusiasts and semi-professionals alike.

**KEY SPECS** 24.3MP full-frame sensor; 39-point autofocus (9 cross-type); 5.5fps burst mode; dual SDXC slots; 141 x 82 x 113mm; 850g

#### ALTERNATIVE

#### Canon EOS 650D

Touchscreen controls and a vastly improved autofocus make the 650D the best all-round consumer DSLR on the market.  
 £459 (£551); [www.amazon.co.uk](http://www.amazon.co.uk) **WEB ID 377503**

### DIGITAL VIDEO CAMERA

#### Panasonic HC-X800

£383 (£459)  
[www.amazon.co.uk](http://www.amazon.co.uk)  
**WEB ID 372862 ISSUE 211**



Now that the HDC-TM900 has disappeared from stores, this is the video camera to buy. It shoots fantastic footage in all conditions and the image stabilisation system is superb.

**KEY SPECS** 1080/50p AVCHD; 3 x 1/4.1in CMOS sensors; 12x optical zoom; 9.15MP; 3in LCD; 63 x 68 x 134mm; 345g

#### ALTERNATIVE

#### GoPro Hero 3 Black Edition

Supreme flexibility and cracking HD video quality make this the best action sports camera we've seen. Well worth the cash.  
 £300 (£360); [www.parkcameras.co.uk](http://www.parkcameras.co.uk) **WEB ID N/A**

**NEW**





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[www.pcprow.co.uk/reviews](http://www.pcprow.co.uk/reviews)

## PRINTERS

### CONSUMER ALL-IN-ONE

#### Canon Pixma MG5450



£78 (£93)  
[www.printerbase.co.uk](http://www.printerbase.co.uk)  
**WEB ID** N/A **ISSUE** 224

The Pixma MG5450 works wonders with its five-ink print engine, serving up high-quality prints and copies, and crystal-clear scans. Long-term running costs are reasonable.

**KEY SPECS** 5-ink engine; 7.5cm screen; 125-sheet input tray; duplex; 802.11n Wi-Fi; 455 x 369 x 148mm

#### ALTERNATIVE

#### HP Photosmart 5520

HP's Photosmart 5520 conjures up good-quality photos and great performance. Running costs are relatively low, too.  
 £58 (£70); [www.johnlewis.co.uk](http://www.johnlewis.co.uk) **WEB ID** N/A

### OFFICE ALL-IN-ONE

#### Epson WorkForce WF-3530DTWF



£108 (£130)  
[www.ukinsight.com](http://www.ukinsight.com)  
**WEB ID** N/A **ISSUE** 224

Epson's inkjet MFD packs in plenty of features for relatively little cash. While print quality isn't stunning, it's speedy at everything bar photo printing; and running costs are low.

**KEY SPECS** 4-ink print engine; 6.3cm screen; 2 x 250-sheet input trays; 3-sheet ADF; duplex; fax; Ethernet; 802.11n Wi-Fi; 449 x 427 x 308mm

#### ALTERNATIVE

#### HP Officejet 6700 Premium

It can't match the Epson for speed or features, but with solid quality and low running costs, HP should be on your shortlist.  
 £83 (£100); [www.amazon.co.uk](http://www.amazon.co.uk) **WEB ID** N/A

### PERSONAL LASER

#### Lexmark C540n



£99 (£119)  
[www.printerland.co.uk](http://www.printerland.co.uk)  
**WEB ID** 353659 **ISSUE** 199

A well-built, network-capable colour laser with reasonable running costs, a huge 250-sheet paper tray and fast, top-quality document and image output – all at a competitive price.

**KEY SPECS** A4 colour laser; 21ppm speed; USB; Ethernet; 250-sheet input tray; 100-sheet output tray; 595 x 495 x 402mm

#### ALTERNATIVE

#### Brother HL-2270DW

A mono laser with all the features a home office needs, plus good print speed and quality as well.  
 £119 (£143); [www.printerland.co.uk](http://www.printerland.co.uk) **WEB ID** 362242

## SOFTWARE

### INTERNET SECURITY

#### Bitdefender Internet Security 2013

£13 (£15), 3 PCs, 1yr  
[www.amazon.co.uk](http://www.amazon.co.uk)  
**WEB ID** N/A **ISSUE** 221

Bitdefender partners a comprehensive set of features with exceptional malware detection – and for a bargain price.

#### ALTERNATIVE

#### Avast Free Antivirus

The best free antivirus, with great protection and oodles of features.  
 Free; [www.avast.com](http://www.avast.com)  
**WEB ID** N/A

### BACKUP/STORAGE

#### Livedrive

£5/mth (unlimited GB), 1 PC  
[www.livedrive.com](http://www.livedrive.com)  
**WEB ID** 373558 **ISSUE** 210

Easy to use, cheap and packed with features, Livedrive is the best all-in cloud storage service.

#### ALTERNATIVE

#### Dropbox

Dropbox makes sharing and syncing files easy across most devices.  
 2GB, free; [www.dropbox.com](http://www.dropbox.com)  
**WEB ID** 373561

### ACCOUNTING

#### FreeAgent

£18/mth, unlimited users  
[www.freeagent.com](http://www.freeagent.com)  
**WEB ID** 367126 **ISSUE** 201

Small-business owners, freelancers and traders lacking accounting experience will love the online FreeAgent.

#### ALTERNATIVE

#### Sage Instant Accounts 2012

Support is limited, but otherwise this is a fine package at a good price.  
 £101 (£121); [www.lambda-tek.com](http://www.lambda-tek.com)  
**WEB ID** 375481

### PRODUCTIVITY

#### Microsoft Office 2013

From £92 (£110)  
<http://office.microsoft.com>  
**WEB ID** 379510 **ISSUE** 220

Office remains the ultimate office suite, but despite new touch-friendly features, existing users needn't rush to upgrade.

#### ALTERNATIVE

#### Scrivener for Windows

The ultimate document creation and organisation tool for serious writers.  
 £23 (£27); [www.literatureandlatte.com](http://www.literatureandlatte.com)  
**WEB ID** 371680

### WEB DEVELOPMENT

#### Drupal 7

Free  
[www.drupal.org](http://www.drupal.org)  
**WEB ID** 364549 **ISSUE** 198

It isn't a simple turn-key CMS, but the combination with its add-on modules puts it a step ahead of the competition.

#### ALTERNATIVE

#### Adobe Dreamweaver CS6

Improved for mobiles, although no longer the dominant web standard it once was.  
 £309 (£371); [www.ebuyer.com](http://www.ebuyer.com)  
**WEB ID** 374221

### GRAPHICS/DESIGN

#### Adobe CS6 Design Standard

£999 (£1,199)  
[www.morecomputers.com](http://www.morecomputers.com)  
**WEB ID** 374218 **ISSUE** 213

Photoshop, InDesign and Illustrator all benefit from interface overhauls and much deeper improvements.

#### ALTERNATIVE

#### Xara Photo & Graphic Designer 7

Graphic design, photo editing and much more in one bargain package.  
 £13 (£16); [www.amazon.co.uk](http://www.amazon.co.uk)  
**WEB ID** 368470

### PHOTO EDITING

#### Adobe Photoshop Lightroom 5

Expected to be £75 (£91)  
[www.adobe.com](http://www.adobe.com)  
**WEB ID** N/A **ISSUE** 225

Substantial new features and editing tools make Lightroom 5 better than ever, provided Adobe doesn't hike the price.

#### ALTERNATIVE

#### Adobe Photoshop CS6

Hugely expensive, but for professionals nothing else comes close.  
 £526 (£631); [www.amazon.co.uk](http://www.amazon.co.uk)  
**WEB ID** 373714

### VIDEO EDITING

#### Adobe Premiere Pro CS6

£613 (£736)  
[www.ebuyer.com](http://www.ebuyer.com)  
**WEB ID** 374092 **ISSUE** 213

A new interface and improved engine make this powerful, professional editor more tempting than ever.

#### ALTERNATIVE

#### Sony Movie Studio Platinum 12

64-bit support and powerful editing tools unite in an affordable package.  
 £29 (£35); [www.amazon.co.uk](http://www.amazon.co.uk)  
**WEB ID** 376474

### AUDIO PRODUCTION

#### Steinberg Cubase 7

£362 (£434)  
[www.dv247.com](http://www.dv247.com)  
**WEB ID** 378724 **ISSUE** 221

An overhaul of a heavyweight package, Cubase provides experienced users with the most precise and flexible tools yet.

#### ALTERNATIVE

#### Ableton Live 8

The best version of Live yet, with a well-rounded feature set.  
 £249 (£299); [www.studiospares.com](http://www.studiospares.com)  
**WEB ID** 257713



## NETWORKING

### EXTERNAL HARD DISK

#### Western Digital My Passport

2TB, £85 (£103)  
www.amazon.co.uk  
WEB ID 380806 ISSUE 224



The My Passport matches huge capacity with superb value. It has no gimmicks, but it's the drive of choice when it comes to space and price.

**KEY SPECS** 2TB HDD; USB 3; 2yr RTB warranty; 82 x 111 x 15mm; 230g

#### ALTERNATIVE

#### Buffalo HDW-PU3 MiniStation Air

Wireless access makes this a versatile alternative, although the price is inflated to accommodate this feature.

500GB, £81 (£97); www.dabs.com WEB ID 380806

### NETWORK STORAGE

#### Synology DS213air

Diskless, £190 (£228)  
www.ballicom.co.uk  
WEB ID N/A ISSUE 225



**NEW ENTRY**

Synology adds Wi-Fi, a faster processor and USB 3 ports to its award-winning DS212j, and comes up with a real winner. It's fast, flexible and fantastically easy to use.

**KEY SPECS** 2 x 3.5in drive bays; 802.11n Wi-Fi; Synology Hybrid RAID, JBOD, RAID0, 1; 2 x USB 3; 2yr RTB warranty; 100 x 225 x 164mm

#### ALTERNATIVE

#### Qnap TS-412 Turbo NAS

This four-bay NAS device doesn't major on speed, but good design and a range of features make it the high-end choice.

Diskless, £212 (£255); www.kikatek.com WEB ID 374695

### WIRELESS ROUTER

#### Asus DSL-N55U

£85 (£102)  
www.broadbandbuyer.co.uk  
WEB ID N/A ISSUE 225



**NEW ENTRY**

The Asus DSL-N55U is a superb all-rounder. It combines a great range of features with a clear, accessible user interface, and wireless performance is right up there with the best.

**KEY SPECS** Concurrent dual-band 802.11n ADSL2/2+ router; 4 x Gigabit Ethernet; 2 x USB 2; 207 x 149 x 36mm

#### ALTERNATIVE

#### Netgear DGND4000

A huge range of features including ADSL and cable support, good future-proofing and quick performance. A worthy choice.

£80 (£96); www.broadbandbuyer.co.uk WEB ID N/A

**NEW**

## COMPONENTS

### PROCESSOR

#### Intel Core i5-3570K

£144 (£173)  
www.amazon.co.uk  
WEB ID 374158 ISSUE 213



It's a little slower than the Core i7s, but Intel's i5-3570K is our chip of choice thanks to its combination of excellent performance and a reasonable price.

**KEY SPECS** 3.4GHz (3.8GHz Turbo Boost); LGA 1155 quad-core CPU; Intel HD Graphics 4000; 6MB L3 cache; 77W TDP; 22nm

#### ALTERNATIVE

#### AMD A10-5800K

AMD's Trinity APU almost keeps pace with the Core i3s, and its graphics performance is streets ahead of Intel's.

£79 (£95); www.ebuyer.com WEB ID 378481

### MOTHERBOARD

#### Asus P8Z77-V Pro

£136 (£164)  
www.amazon.co.uk  
WEB ID 376573 ISSUE 215



The latest Asus includes 802.11n Wi-Fi, as well as almost every feature a PC builder needs, with plenty of sockets, ports and a UEFI BIOS. It's the ideal partner for Ivy Bridge.

**KEY SPECS** Socket LGA 1155; Intel Z77 chipset; 3 x PCI-E x16; 2 x PCI-E x1; 2 x PCI; 4 x USB 3; 4 x DDR3 DIMM sockets; 802.11n Wi-Fi

#### ALTERNATIVE

#### MSI Z77A-G43

MSI's board offers a rich, rounded specification, Intel's Z77 chipset and Ivy Bridge support for a reasonable price.

£60 (£73); www.box.co.uk WEB ID 376576

### SOLID-STATE DISK

#### Samsung 840 Pro

256GB, £140 (£170)  
www.ebuyer.com  
WEB ID 380455 ISSUE 223



Samsung's update to its high-end SSD pushes performance into the stratosphere. Thanks to the proprietary MDX controller and 22nm NAND, the 840 Pro is the fastest SSD we've ever tested.

**KEY SPECS** 2.5in SATA 6Gbits/sec solid-state drive; Samsung MDX controller. Part code: MZ-7PD256BW

#### ALTERNATIVE

#### SanDisk Ultra Plus

It can't match the top-tier SSDs for performance, but this budget unit delivers good all-round performance at a bargain price.

256GB, £104 (£125); www.ebuyer.com WEB ID 380818

### MAINSTREAM GRAPHICS CARD

#### Nvidia GeForce GTX 650 Ti Boost

Typically, £150  
Depends on brand  
WEB ID N/A ISSUE 225



**NEW ENTRY**

Nvidia conjures up a solid mid-range card. If you can't stretch to the GTX 660 Ti, the GTX 650 Ti Boost delivers smooth, Full HD gaming performance for sensible money.

**KEY SPECS** 768 stream processors; 980MHz core; 2GB GDDR5 RAM; 28nm; 1 x 6-pin connector; 240mm long

#### ALTERNATIVE

#### AMD Radeon HD 6450

The HD 6450 is fine for playing HD video on an old PC without modern integrated graphics.

Typically, £30 WEB ID N/A

### ENTHUSIAST GRAPHICS CARD

#### Nvidia GeForce GTX 680

Typically, £360  
Depends on brand  
WEB ID 373696 ISSUE 212



If you have enough cash, Nvidia's 28nm debut blows AMD away: quicker in practically every test, with impressive new features – and it's more efficient, too.

**KEY SPECS** 1,536 stream processors; 1,006MHz core; 2GB/4GB GDDR5 RAM; 28nm; 2 x 6-pin connectors; 257mm long

#### ALTERNATIVE

#### Nvidia GeForce GTX 660 Ti

For flawless single-screen gaming, the GeForce GTX 660 Ti provides a serious amount of bang for your buck.

Typically, £230 WEB ID 376438

### HARD DISK

#### Hitachi Deskstar 7K1000.D

1TB, £49 (£59)  
www.stuff-uk.net  
WEB ID 375973 ISSUE 213



The fastest hard disk in our Labs, yet the price for a terabyte – while not exactly dirt-cheap – isn't nearly as high as you'd expect. A great blend of value and performance.

**KEY SPECS** 3.5in SATA 6Gbits/sec HDD; 7,200rpm spindle speed; 32MB cache; 3yr RTB warranty. Part code: HDS721010DLE630

#### ALTERNATIVE

#### Seagate Barracuda Green

It won't win any speed awards, but this is a very efficient drive at a good price.

2TB, £77 (£93); www.morecomputers.com WEB ID N/A





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## ENTERPRISE

### RACK SERVER

#### Broadberry CyberServe XE5-R224

£3,962 exc VAT  
[www.broadberry.co.uk](http://www.broadberry.co.uk)  
**WEB ID 378319** **ISSUE 219**

With storage space galore, plenty of room for expansion and low power consumption, the CyberServe XE5-R224 loses out only a little on the features front. At this price, it's superb value.

**KEY SPECS** 2U rack chassis; 2.4GHz Xeon E5-2665; 32GB DDR3 RAM; 2 x 300GB SAS HDD; 4 x Gigabit Ethernet; 2 x 750W PSU; 3yr on-site NBD

#### ALTERNATIVE

#### HP ProLiant DL360p Gen8

An extremely well-designed server that squeezes lots into its 1U rack chassis, and presents plenty of room to grow.

£5,159 exc VAT; [www.hp.co.uk](http://www.hp.co.uk) **WEB ID 377143**



### PEDESTAL SERVER

#### Fujitsu Primergy TX100 S3p

£433 exc VAT  
[www.ebuyer.com](http://www.ebuyer.com)  
**WEB ID 377572** **ISSUE 218**

The Primergy TX100 S3p combines all-round quality with an unbeatable price, making it a top choice as a small-business server.

**KEY SPECS** 3.1GHz Xeon E3-1220V2; 8GB DDR3; 2 x 500GB HDD; 4 x PCI-E Gen3; 9 x USB 2; 2 x Gigabit Ethernet; 1yr on-site warranty

#### ALTERNATIVE

#### HP ProLiant ML350p Gen8

A whisper-quiet pedestal server that combines good value, huge expansion potential and class-leading remote management.

£3,795 exc VAT; [www.hp.co.uk](http://www.hp.co.uk) **WEB ID 377701**



### SECURITY APPLIANCE

#### Netgear ProSecure UTM25S

3yr subscription, £739 exc VAT  
[www.ballicom.co.uk](http://www.ballicom.co.uk)  
**WEB ID 380524** **ISSUE 223**

Netgear's ProSecure UTM25S provides good performance and a comprehensive set of security features for considerably less than the opposition. It's an excellent choice for SMBs on a budget.

**KEY SPECS** Desktop chassis; 6 x Gigabit (4 x LAN, 2 x WAN); 2 expansion slots; web browser management; limited lifetime warranty

#### ALTERNATIVE

#### Cyberoam CR35iNG

With an excellent range of security measures and a tempting price, Cyberoam's CR35iNG raises the bar for performance.

3yr, £1,415 exc VAT; [www.vcwsecurity.com](http://www.vcwsecurity.com) **WEB ID 380047**



### STORAGE APPLIANCE

#### Qnap TS-870U-RP

Diskless, £1,466 exc VAT  
[www.broadbandbuyer.co.uk](http://www.broadbandbuyer.co.uk)  
**WEB ID N/A** **ISSUE 225**

Qnap's 8-bay rack NAS appliance offers an unbeatable range of storage features, power redundancy and superfast 10GbE performance for a seriously competitive price.

**KEY SPECS** 2U rack chassis; 8 x hot-swap SATA II/III drive bays; 2 x Gigabit Ethernet; 2 x USB 3; 4 x USB 2; 2 x eSATA; 2 x PCI-E; 2 x 300W PSU

#### ALTERNATIVE

#### Broadberry CyberStore 316S WSS

Broadberry harnesses Windows Storage Server 2012 to provide great value, huge expansion potential and top performance.

£5,400 exc VAT; [www.broadberry.co.uk](http://www.broadberry.co.uk) **WEB ID 380041**



### BACKUP DEVICE

#### Tandberg Data LTO-6 HH

£1,831 exc VAT  
[www.kikatek.com](http://www.kikatek.com)  
**WEB ID 380599** **ISSUE 223**

The LTO-6 HH demonstrates the strengths of the Ultrium LTO-6 tape format. Top performance combines with low storage costs, making it an ideal choice for backup and archiving purposes.

**KEY SPECS** External Ultrium LTO-6 tape drive; native capacity 2.5TB; native transfer rate 160MB/sec; 6GB/sec SAS interface; 3yr warranty

#### ALTERNATIVE

#### HP StorageWorks Ultrium 3000 SAS

Many pundits said tape was dead. They also said that LTO was at the end of its roadmap. HP's 3000 SAS proves them wrong.

£1,241 exc VAT; [www.ebuyer.com](http://www.ebuyer.com) **WEB ID 357982**



### BUSINESS LASER

#### HP LaserJet Pro 200 Colour MFP M276n

£223 exc VAT  
[www.printerbase.co.uk](http://www.printerbase.co.uk)  
**WEB ID 379879** **ISSUE 221**

A fine choice for small businesses that want a versatile, low-cost colour laser MFP. Output quality belies the low price, and HP's web printing features are a cut above the rest.

**KEY SPECS** 600dpi A4 colour laser; 14ppm colour/mono; 1,200dpi colour scanner; 150-sheet input tray; 30-sheet ADF; 1yr on-site warranty

#### ALTERNATIVE

#### Xerox Phaser 7100N

A fast, affordable A3 colour laser with reasonable running costs and exceptional colour quality.

£831 exc VAT; [www.printerland.co.uk](http://www.printerland.co.uk) **WEB ID 379606**



### BUSINESS SCANNER

#### Fujitsu ScanSnap iX500

£300 exc VAT  
[www.lambda-tek.com](http://www.lambda-tek.com)  
**WEB ID N/A** **ISSUE 225**

Fujitsu's ScanSnap iX500 delivers 25ppm scan speeds, and is capable of scanning wirelessly to iOS and Android devices. It also offers great support for the cloud, and is easy to use.

**KEY SPECS** 25ppm colour duplex @ 300dpi, mono @ 600dpi; 50-sheet ADF; USB 3; 802.11bgn Wi-Fi (mobile devices only); 2yr warranty

#### ALTERNATIVE

#### Brother ADS-2600W

With speedy, good-quality scans, plus a huge range of scanning features, Brother's ADS-2600W is a fine business scanner.

£377 exc VAT; [www.ballicom.co.uk](http://www.ballicom.co.uk) **WEB ID 380473**



### NETWORK BACKUP

#### DataFort Hi-5

Unlimited data per server, from £500/mth exc VAT  
**WEB ID 380548** **ISSUE 223**

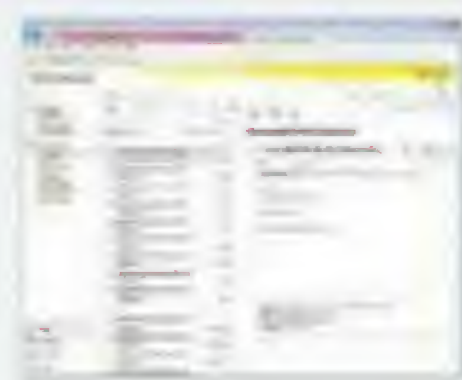
DataFort's Hi-5 combines both on- and off-site protection with a per-server pricing structure that helps keep costs low. With robust performance, optional Exchange server protection and hassle-free data recovery, Hi-5 is an attractive package – especially for SMBs that can't afford to run a contingency site.

#### ALTERNATIVE

#### Securstore Cloud Backup

A feature-packed choice for SMBs requiring off-site backup for critical systems. The sensible pricing structure is a boon, too.

100GB, £200/mth exc VAT; [www.securstore.com](http://www.securstore.com) **WEB ID 380098**



### NETWORK MONITORING

#### Paessler PRTG Network Monitor 9

500 sensors, £839 exc VAT  
[www.paessler.com](http://www.paessler.com)  
**WEB ID 371584** **ISSUE 208**

Licensed by the number of sensors, and with a proprietary database included, PRTG offers great value with no hidden costs. It provides an impressive range of network-monitoring tools and combines them with quality reporting and alerting facilities, making it our favourite network-monitoring tool.

#### ALTERNATIVE

#### Ipswitch WhatsUp Gold v16 Premium

This update bolsters its appeal to larger businesses, with slick new network- and wireless-monitoring tools.

100 devices, £2,416 exc VAT; [www.ipswitch.com](http://www.ipswitch.com) **WEB ID 380107**





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## Microsoft should make the orphaned Windows XP open source, says **JON HONEYBALL**

**M**icrosoft has reminded us that there's less than a year to go until all support ceases for Windows XP (the date in question is 8 April 2014, to be precise). That's one year in which all the machines running the 12-year-old operating system need to be upgraded or put in the skip.

Or so you would be made to believe. It isn't really clear how many XP machines are still out there. Some websites and browser-tracking engines claim it's as many as 40% of the installed PC base. Microsoft doubtless has a good idea, thanks to its Windows Upgrade service, but that presumes all Windows XP machines are actually updating, and I know that's far from the truth. Given the number of zombie machines out there, and the number I have to fix for friends, there are clearly many that haven't been updated in years.

Then there are the machines that can't be updated easily. A friend has a very expensive audio analyser that sits in an external box and connects to his PC via a custom ISA card. The version of the software that supports this dies

machines aren't locked down, hidden away, and disconnected from the public internet. That's where the problem arises.

I understand why Microsoft wants to stop supporting XP: it costs the company money. It needs test labs, programmers who understand the codebase, up-to-date internationalisation, and adequately trained support teams around the world. This comes at a considerable cost, and for a product that Microsoft sold more than ten years ago.

The issue is that the threat of removing support isn't going to change anything for the customers who can't, or won't, change platforms. Life will simply keep going until something nasty happens, such as the OS getting hacked or the hardware keeling over.

There's a simple, if brave, solution. Microsoft should open source XP. I don't mean all the twiddly bits and unnecessary pieces; I mean the core OS stack, driver model and all the pieces that are the real heart of the operating system. Microsoft has an open-source division, and all the capability required to do this. Placing XP into open source would allow the community to build up its own support infrastructure for the OS, meaning Microsoft could quite legitimately walk away from the operating system and take all that cost off its bottom line, but do so in a way that doesn't entirely abandon its remaining customers.

You might think there's a whole pile of intellectual property, some owned by third parties, held in XP. There might be, but much will be in the periphery, such as codecs that don't need to be open-sourced at all. There might be some hidden wonder-coding in XP that Microsoft doesn't want to make public, but you must remember that the academic world has had access to source code for years.

Also, there's no reason why Microsoft can't lock down the open-sourcing of XP with a licence that says you can fix it, but not distribute full, installable working copies. Surely the licensing team behind such wonders as "only install Office 2013 on the first machine it touches" could come up with suitable wording for such a scenario.

So, Mr Ballmer, here's the deal. I dare you to open source XP. The time is right, it would look great to your customer base and your investors, and it's clearly the right thing to do for the customers who are still running XP. Is this "new-era Microsoft" really up to the task of supporting its customers in the long term? It's time to see.

“

Placing XP into open source would allow the community to build up its own support infrastructure for the OS

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on anything after Windows XP. What is he to do? Upgrade the hardware at great cost just so he can run Windows 7, despite it giving him no new capabilities he needs? It makes you wonder how many lab systems are stuck on Windows XP when research money doesn't allow for arguably unnecessary updating, and how many ATMs and railway-station display systems are running on XP, too.

In reality, there's no need for these machines to change – if they're adequately protected from the internet and the local area network. Let me embolden, double-underline and put in bright-red flashing lights the phrase "adequately protected". These aren't public IP-addressable machines. They shouldn't be accessible to users, even via internal networks. They should be locked down tighter than a drum. Paranoia is your middle name.

If that's done, there's no reason why such a PC can't continue to give sterling service until it crumbles. The problem is that many of these

**JON HONEYBALL** has contributed to *PC Pro* since issue 1, when we were still trying to bury Windows 3.1 under the patio.

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